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DELAWARE RIVER BASIN
TRIBUTARY TO WEST BRANCH LACKAWAXEN RIVER,
WAYNE COUNTY

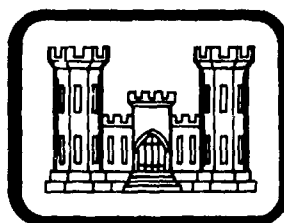
PENNSYLVANIA

PONDEROSA PINES DAM

NDI ID NO. PA-00304
DER ID NO. 64-204

PETER GRIMM AND MILTON ROEGNER

PHASE I INSPECTION REPORT
NATIONAL DAM INSPECTION PROGRAM



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Prepared by
Geo-Technical Services, Inc.

CONSULTING ENGINEERS & GEOLOGISTS

851 S. 19th Street
Harrisburg, Pennsylvania 17104

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For
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Baltimore District, Corps of Engineers
Baltimore, Maryland 21203

AUGUST 1981

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DACW31-81-C-0019

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PREFACE

This report is prepared under guidance contained in the Recommended Guidelines for Safety Inspection of Dams, for Phase I Investigations. Copies of these guidelines may be obtained from the Office of Chief of Engineers, Washington, D.C. 20314. The purpose of a Phase I Investigation is to identify expeditiously those dams which may pose hazards to human life or property. The assessment of the general condition of the dam is based upon available data and visual inspections. Detailed investigations, testing, and detailed computational evaluations are beyond the scope of a Phase I investigation; however, the investigation is intended to identify any need for such studies.

In reviewing this report, it should be realized that the reported condition of the dam is based on observations of field conditions at the time of inspection along with data available to the inspection team. In cases where the reservoir was lowered or drained prior to inspection, such action, while improving the stability and safety of the dam, removes the normal load on the structure and may obscure certain conditions which might otherwise be detectable if inspected under the normal operating environment of the structure.

It is important to note that the condition of a dam depends on numerous and constantly changing internal and external conditions, and is evolutionary in nature. It would be incorrect to assume that the present condition of the dam will continue to represent the condition of the dam at some point in the future. Only through frequent inspections can unsafe conditions be detected and only through continued care and maintenance can these conditions be prevented or corrected.

Phase I inspections are not intended to provide detailed hydrologic and hydraulic analyses. In accordance with the established Guidelines, the spillway design flood is based on the estimated "Probable Maximum Flood" for the region (greatest reasonable possible storm runoff), or fractions thereof. The spillway design flood provides a measure of relative spillway capacity and serves as an aid in determining the need for more detailed hydrologic and hydraulic studies, considering the size of the dam, its general condition and the downstream damage potential.

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PHASE I INSPECTION REPORT
NATIONAL DAM INSPECTION PROGRAM
BRIEF ASSESSMENT OF GENERAL CONDITION
AND
RECOMMENDED ACTION

Name of Dam: Ponderosa Pines Dam
NDI ID NO. PA-00304
DER ID NO. 64-204

Size: Small (15.2 feet high, 67 acre-feet)

Hazard Classification: High

Owner: Peter Grimm and Milton Roegner
Box 1341, R. D. #3
Honesdale, Pa. 18431

State Located: Pennsylvania

County Located: Wayne

Stream: Tributary to West Branch Lackawaxen River

Date of Inspection: June 25, 1981

Based on visual inspection, field survey and calculations, Ponderosa Pines Dam is judged to be in poor condition. Based on the high hazard classification of the dam and in accordance with the recommended guidelines, the Spillway Design Flood (SDF) varies between the one-half of the Probable Maximum Flood (1/2 PMF) and the full PMF. Because of the small storage capacity in the reservoir, the 1/2 PMF is selected for the SDF. Results of the hydrologic and hydraulic analysis indicate that the derived peak inflow into the reservoir at the selected SDF is 470 cfs (cubic feet per second). The present spillway capacity of 75 cfs is equivalent to a flood magnitude of approximately 15% of the PMF. The dam will overtop by flood magnitudes less than the SDF. Overtopping depths of 0.6 and 0.8 foot were derived for flood magnitudes of 30% and 50% of the PMF. The duration of overtopping for the aforementioned floods is 5.5 and 7.25 hours, respectively. It was judged that the dam cannot withstand the depth and duration of overtopping resulting from flood magnitude of 0.3 PMF without failure. Failure of the dam will increase the downstream hazard to loss of life.

As the spillway cannot pass the 1/2 PMF without overtopping the dam and since overtopping at less than 1/2 PMF would cause failure which would significantly increase hazard to loss of life downstream, the spillway capacity is seriously inadequate and the facility is rated unsafe, non-emergency.

PONDEROSA PINES DAM

Although there is no visible evidence of structural instability, the erosion of the downstream slope below the outlet pipe and the leakage below the toe of the dam are of concern. Should the observed erosion and leakage remain unchecked, it could, in time, affect the structural integrity of the dam.

The invert elevation of the outlet pipe is but 2.1 feet below the spillway crest. There are no means to lower the reservoir level below the present level of the pipe inlet in case of emergency.

The maintenance of the dam is limited to mowing grass on the crest and a portion of the upstream slope of the embankment. The balance of the dam is poorly maintained, as indicated by the trees and brush on the downstream slope and at the toe of the dam, as well as by the existence of erosion scarps below the outlet pipe.

There is no warning system and evacuation plan in effect at the present time.

The following investigations and remedial measures are recommended for immediate implementation by the owner:

- (1) Engage a Professional Engineer, experienced in the design and construction of dams, to perform additional hydrologic and hydraulic analysis to more accurately determine the required spillway capacity. As a result of the analysis, design and construct a spillway that will pass the required SDF without overtopping the dam.
- (2) Repair the erosion scarp and replace the displaced splash slab below the outlet pipe.
- (3) Develop a method to draw down the reservoir in emergencies.
- (4) Remove trees and brush from the downstream slope and the toe of the embankment, under the supervision of a Professional Engineer.
- (5) Monitor the rate and clarity of the point source leakage and any changes in the extent of the wet area below the toe of the dam and take appropriate action as required.
- (6) Observe the presently unprotected upstream slope for wave erosion damage and repair as necessary.

In addition, it is recommended that the owner take the following precautionary operation and maintenance measures:

- (1) Develop a detailed emergency operation procedure and warning system to facilitate timely and orderly evacuation of the downstream population if any hazardous conditions at the dam are observed.
- (2) When warnings of a storm of major proportions are given by the National Weather Service, activate the emergency operation and warning system procedures.

PONDEROSA PINES DAM

- (3) After satisfactory implementation of the remedial measures resulting from the recommended additional investigations, institute a formal inspection and maintenance program for the dam. As presently required by the Bureau of Dams and Waterway Management of PENNDER, the program shall include an annual inspection of the dam by a Professional Engineer, experienced in the design and construction of dams. Deficiencies found during annual inspections should be remedied as necessary.



Approved by:

GEO-TECHNICAL SERVICES, INC.

Gideon Yachin

GIDEON YACHIN, P.E.

Date: August 31, 1981

Approved by:

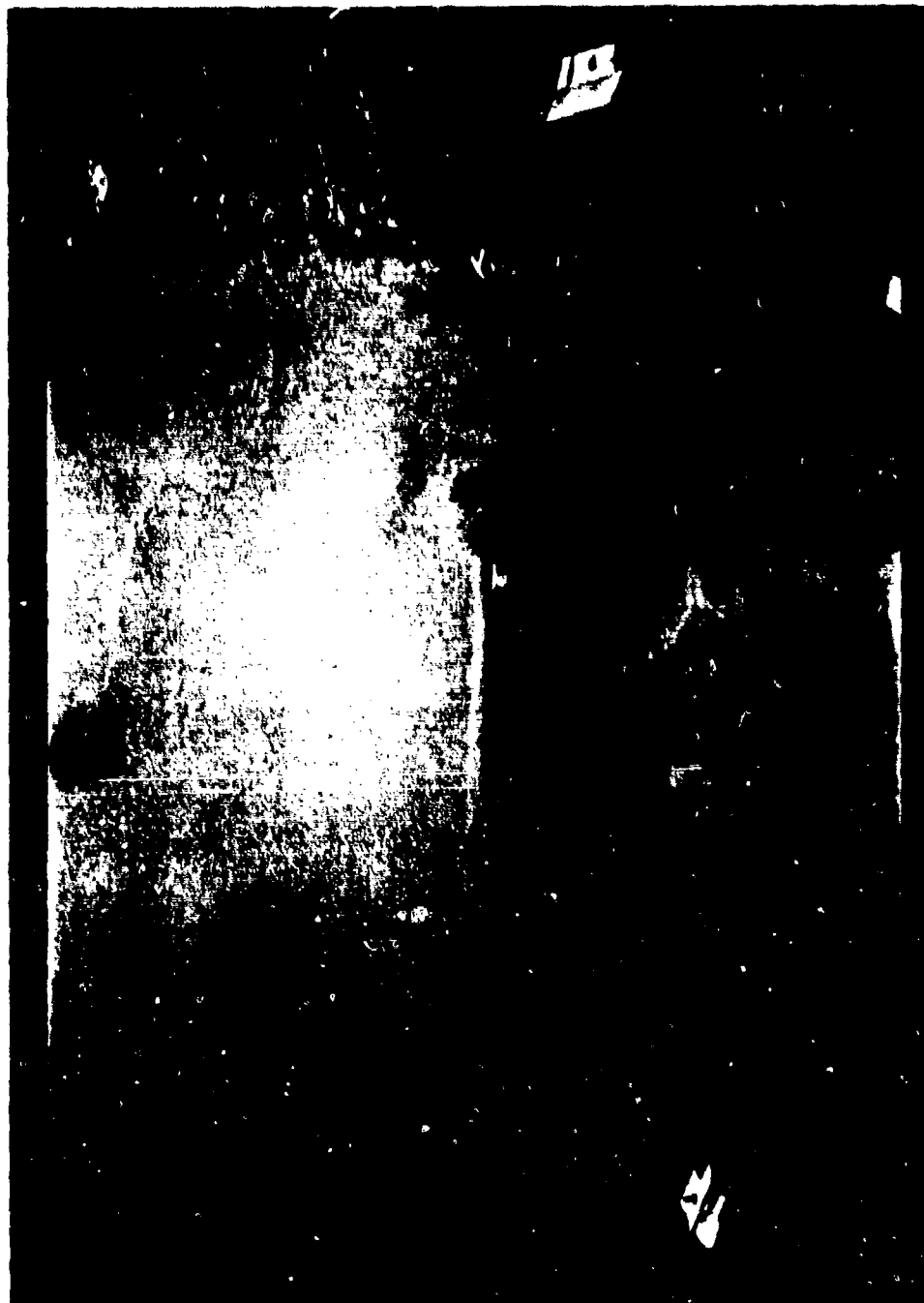
DEPARTMENT OF THE ARMY
BALTIMORE DISTRICT, CORPS OF ENGINEERS

James W. Peck

JAMES W. PECK
Colonel, Corps of Engineers
District Engineer

Date: 10 Sep 81

PONDEROSA PINES DAM (PA-00304)
(SPILLWAY LEFT OF PHOTO DISCHARGING INTO POND IN FOREGROUND)



OVERVIEW

PHASE I INSPECTION REPORT
NATIONAL DAM INSPECTION PROGRAM
PONDEROSA PINES DAM

NDI# PA-00304, PENNDER# 64-204

SECTION 1

GENERAL INFORMATION

1.1 Authority.

The Dam Inspection Act, Public Law 92-367, authorized the Secretary of the Army, through the Corps of Engineers, to initiate a program of inspection of dams throughout the United States.

1.2 Purpose.

The purpose is to determine if the dam constitutes a hazard to human life or property.

1.3 Description of Project.

a. Dam and Appurtenances: Ponderosa Pines Dam is an earthfill embankment 15.2 feet high and 450 feet long, including spillway. The spillway is located at the right abutment, consisting of an earth channel having a trapezoidal cross section. The bottom width of the spillway at the beginning of the approach channel is 15 feet, narrowing to a 10-foot long width at the dam axis. The outlet works consist of an 18-inch diameter corrugated metal pipe (CMP) that is normally plugged and having an invert elevation 2.1 feet below the elevation of the spillway crest, the normal pool elevation.

b. Location: Ponderosa Pines Dam is located on a tributary of the West Branch Lackawaxen River in Dyberry Township, Wayne County, 2.5 miles southeast of the intersection of State Routes 247 and 670 at Red Schoolhouse Corner and 1.6 miles northeast of Aldenville, Pennsylvania. The dam and reservoir are contained within the Aldenville, Pennsylvania 7.5 Minute series USGS Quadrangle map, at latitude N41 39'30" and Longitude W75 20'05". A Location Map is shown in Exhibit E-1.

c. Size Classification: Small (15.2 feet high, 67-acre feet storage capacity at top of dam).

d. Hazard Classification: High (see paragraph 3.1e).

e. Ownership: Peter Grimm and Milton Roegner, Box 1341, R. D. #3, Honesdale, Pennsylvania 18431.

f. Purpose of Dam: Recreation.

g. Design and Construction History: Information related to the design and construction of the dam is not available. The present owners, who acquired the facility in 1975, reported that the dam existed in 1970.

h. Normal Operational Procedure: The pool is maintained at spillway crest elevation with excess inflow discharging over the spillway into a lower pond, located immediately downstream of the Ponderosa Pines Dam. The water level is lowered in the fall of every year to the invert elevation of the outlet pipe, regulated by a cap at the pipe inlet. The minimum level of the pool during the fall and winter months is 2.1 feet below the normal pool level. There are no existing facilities to drain the reservoir below the aforementioned lower pool level.

1.4 Pertinent Data.

| | |
|--|-----------|
| a. <u>Drainage Area:</u> (square miles) | 0.27 |
| b. <u>Discharge at Damsite:</u> (cfs) | |
| Maximum known flood at damsite since construction | Not Known |
| Outlet Works | |
| At minimum pool (el. 1402.9) | 0.0 |
| At maximum pool (el. 1406.3) | 12 |
| Spillway Capacity at maximum pool elevation | |
| Design Conditions | Not Known |
| Existing Conditions | 75 cfs |
| c. <u>Elevation:</u> (feet above msl) See paragraph 3.1a for datum | |
| Top of Dam | |
| Design Conditions | Not Known |
| Existing Conditions (lowest point) | 1406.3 |
| Maximum pool | |
| Design Conditions | Not Known |
| Existing Conditions | 1406.3 |
| Normal pool (spillway crest) | 1405.0 |
| Upstream invert outlet works | 1402.9 |
| Downstream invert outlet works | 1400.5 |
| Inlet of Middle Lake | 1390.8 |
| Tailwater at normal pool in Middle Lake | 1390.8 |
| Downstream toe of embankment | 1391.1 |
| d. <u>Reservoir Length:</u> (feet) | |
| Normal pool | 900 |
| Maximum pool (at top of dam) | 940 |

| | |
|---|-----------|
| e. <u>Storage: (acre-feet)</u> | |
| Normal pool | 51 |
| Maximum pool | |
| Design Conditions | Not Known |
| Existing Conditions | 67 |
| f. <u>Reservoir Surface: (acres)</u> | |
| Normal pool | 10.1 |
| Maximum pool | |
| Design Conditions | Not Known |
| Existing Conditions | 15.3 |
| g. <u>Dam:</u> | |
| Type - Earthfill embankment | |
| Length (feet), including spillway | 450 |
| Height (feet) | 15.2 |
| Top width (feet) | |
| Design Conditions | Not Known |
| Existing Conditions (varies from 14' at the middle of the embankment to 30' near the right abutment, left of spillway). | |
| Side Slopes | |
| Upstream slope - Top 3 feet varies from 1V:1H near the middle of the embankment to 1V:3H near the left abutment. | |
| Downstream slope - Varies from 1V:1.7H at the maximum section to 1V:0.8H at the outlet of 18" diameter CMP. | |
| Zoning | Unknown |
| Cut-off | Unknown |
| Impervious Core | Unknown |
| Grout Curtain | Unknown |
| h. <u>Diversion and Regulating Tunnel:</u> | None |
| i. <u>Spillway:</u> | |
| Type - An earth channel, having a trapezoidal cross sectional area. | |
| Crest Elevation | |
| At inlet to approach channel | 1405.0 |
| At control section, near dam axis | 1404.8 |
| Length of crest (feet) | |
| At inlet to approach channel | 15 |
| At control section, near dam axis | 10 |

i. Spillway (continued)

Upstream channel - Bottom slope 2% to control section along a distance of 26 feet.

Downstream channel - Bottom slope 2% to a point, 40 feet from spillway inlet. 9% slope to inlet of Middle Lake.

j. Outlet Works:

Type - 18 inch diameter CMP with upstream control.

Length (feet) 28

Closure and Regulating Facilities - a cap on the pipe inlet, operated by wedging to pry open.

Access From Upstream Slope

SECTION 2
ENGINEERING DATA

2.1 Design.

There is no available information relative to the design of the dam.

2.2 Construction Records.

There are no available construction records of the facility.

2.3 Operation.

There are no records to indicate the operational procedure of the facility prior to 1975. For operational procedure since 1975, see paragraph 1.3h.

2.4 Other Investigations.

No other documented investigations were available for use in evaluating the dam.

2.5 Evaluation.

a. Availability of Data: There are no plans or other information available on the design and construction of the dam.

b. Adequacy: In the absence of design and construction records, assessment of the dam and its safety must be based on the visual inspection (see Section 3, and Appendix C), field survey (see Exhibits, Appendix A) and the hydrologic and hydraulic analysis (presented in Section 5).

SECTION 3

VISUAL INSPECTION

3.1 Observations.

a. General: The overall appearance of the dam is poor. Deficiencies observed during the field inspection are illustrated on the General Plan, Exhibit A-1 of Appendix A. Surveyed profile of the dam crest, typical dam sections and details of the appurtenant structures are presented in Exhibits A-2, A-3 and A-4, respectively (see Appendix A). The survey datum for this inspection is based on interpolation of the USGS contour lines (see Exhibit E-1). On the inspection date (June 25, 1981), the pool was at elevation 1405.1, 0.1 foot above the normal pool. Pertinent observed features are shown in photographs, presented in Appendix C.

b. Embankment: Observations made during the field inspection indicate that maintenance of the dam is limited to the crest and the upstream face, above the normal pool (see photographs 1, 3, 4 and 6, Appendix C). The visible upstream slope and the crest of the embankment are seeded. The entire downstream slope is covered with brush and up to 12-inch diameter trees (see photographs 6, 7, 8 and 9, Appendix C). The crest width of the embankment varies from 14 feet at the middle of the dam to 30 feet near the right abutment. Typical dam sections, shown in Exhibits A-3 and A-4, Appendix A, indicate that the top of the upstream slope varies from 1V:1H (1 Vertical on 1 Horizontal) at the maximum section, to 1V:3H near the left abutment. The downstream slope is 1V:1.7H at the maximum section of the embankment, steepening toward the left abutment. The downstream slope at the 18-inch diameter corrugated metal pipe (CMP) outlet is 1V:0.8H with severe slope erosion below the invert of the outlet pipe (see Exhibit A-4, Appendix A, and Photographs 9 and 10, Appendix C). A wet marshy area, approximately 15 feet in diameter, typified by the growth of reeds, is located near the toe at the center of the embankment, approximately 40 feet to the right of the outlet pipe. A point source leak, at an estimated rate of 10 GPM (gallons per minute), is located near the center of the wet marshy area (see Exhibit A-1, Appendix A and Photographs 12 and 13, Appendix C).

c. Appurtenant Structures:

(1) Spillway: The appearance of the spillway approach channel is good (see photographs 4 and 5, Appendix C). The bottom of the channel along the first 40 feet of the 190-foot-long spillway has a 2 percent slope and is lined with riprap. The remaining 150 feet of the spillway outlet channel has an irregular bottom width with scattered boulders along its alignment and is overgrown with brush and trees (see Photograph 11, Appendix C). The average bottom width and slope of the spillway outlet channel are 10 feet and 9 percent, respectively. The spillway channel terminates with a cluster of placed boulders at the upstream edge of the Middle Lake, shown in Exhibit A-1, Appendix A, and Photographs 14 and 15, Appendix C.

(2) Outlet Works: The outlet works consist of an 18-inch diameter corrugated metal pipe (CMP) with the elevation of the invert at the pipe inlet being 2.1 feet below the spillway crest elevation. Flow through the outlet works is controlled by wedging and prying open a cap, fitted at the pipe's inlet. The cap is normally fully covering the inlet and the normal pool is at the spillway crest. On the day of the inspection (June 25, 1981), dripping of water at an estimated rate of 0.5 GPM was observed at the pipe outlet (see Photograph 10, Appendix C), indicating that the cap is quite adequate to control the flow through the outlet works. The outlet pipe is steeply sloped (8.5%) and the outlet protrudes approximately 2 feet from the downstream slope of the embankment. The condition of the pipe outlet is good. However, two 5-foot diameter sandstone slabs, assumed to be originally located below the pipe outlet, were displaced by undermining (see Photographs 9 and 10, Appendix C). There are no visible means to draw down the reservoir level below the level of the 18-inch diameter pipe.

d. Reservoir Area: The watershed is predominantly wooded, rising from the normal pool (elevation 1405) to elevation 1640, approximately 3000 feet left of the left abutment. Slopes are moderate along the left bank of the pond to steep near the right abutment of the dam. The watershed features are presented in Exhibit E-1. Geologic conditions of the general area are described in Appendix F. The potential of increased development changing the hydrologic characteristics of the watershed is considered to be remote.

e. Downstream Channel: The spillway and outlet works discharge into Middle Lake, located immediately downstream of the dam (see Exhibit A-1 and Photographs 14 and 15, Appendix C). The Middle Lake dam is an earthfill embankment, 7 feet high and 210 feet long, including a spillway. Three seasonally occupied residences are located downstream of the Ponderosa Pines Dam. Two of these residences are located on the left abutment of the Middle Lake dam (see Photographs 14 and 15, Appendix C). The first floor elevation of the white one-story building, consisting of a home and a sales office, is 1.2 feet above the lowest crest elevation of the Middle Lake dam. The first floor elevation of the second residence, a duplex, is 2.9 feet above the Middle Lake dam. The first floor elevation of the right abutment dwelling is 1.2 feet above the low point of the Middle Lake dam. The lake level is maintained at normal pool with excess inflow discharging through the spillway into a tributary of the West Branch Lackawaxen River. After crossing a dirt road through a culvert, the stream discharges into Lower Lake, owned by Sally Moore. The two downstream dams are classified as low hazard dams. Should Ponderosa Pines Dam fail when the three buildings are occupied, more than a few lives could be lost and extensive damages may occur. Consequently, Ponderosa Pines Dam is classified as high hazard structure.

SECTION 4

OPERATIONAL PROCEDURE

4.1 Normal Operating Procedure.

The reservoir is maintained at normal pool level during the spring and summer months. Excess inflow discharges over the spillway, through a middle and lower ponds, into a tributary of West Branch Lackawaxen River. During the fall of each year, the water level is lowered (by removing the cap from the 18-inch diameter CMP) to a maximum of 2.1 feet below the normal pool.

4.2 Maintenance of Dam.

The maintenance of the dam is limited to mowing the grass on the crest and portion of the upstream slope of the embankment. The balance of the dam is poorly maintained, as indicated by the trees and brush on the downstream slope, at the toe and within the spillway outlet channel, as well as the erosion scarps below the outlet pipe (see Photographs 8, 9, 10 and 11, Appendix C).

4.3 Maintenance of Operating Facilities.

The only operating facility is a cap over the inlet of the 18-inch diameter CMP. The cap is operable by wedging and prying from the upstream slope of the dam. This cap is operational and is being used at least twice a year (see also paragraph 4.1).

4.4 Warning System in Effect.

There is no emergency operation and warning system in effect. The downstream hazard area consists of three seasonally occupied buildings within the property of Ponderosa Pines Camping grounds (see paragraph 3.1e).

4.5 Evaluation.

The present maintenance of the dam and appurtenant structures is unsatisfactory. Upon the removal of all trees and brush from the earth embankment and from the toe of the dam, the owner should institute regularly scheduled maintenance inspections. These inspections should include the monitoring of the existing and any newly developed seepage areas when the reservoir is at normal pool, as well as the erosion below the outlet pipe. Appropriate remedial measures should be taken, as necessary.

Institution of a surveillance program and a warning system is necessary should adverse conditions develop at the dam. A formal plan for an orderly evacuation of the downstream population is required to prevent loss of life should the dam fail.

SECTION 5
HYDROLOGY AND HYDRAULICS

5.1 Design Data.

There is no information available to indicate the design criteria for the Ponderosa Pines Dam.

5.2 Experience Data.

There are no records available to indicate the maximum pool attained by the reservoir during the past floods. The May 1942 and the August 1955 floods are believed to be the record floods at the damsite. The owners stated that the dam was never overtopped since its acquisition in 1975.

5.3 Visual Observations.

Based on visual inspection and field survey, described in Section 3 of this report, the observations relevant to hydrology and hydraulics are evaluated below:

a. Embankment: The top of dam has an irregular profile and its lowest point is at elevation 1406.3, or 1.3 feet above the elevation of the normal pool. The steep downstream slope of the dam suggests that the dam could not withstand overtopping, even for relatively short periods, without failure.

b. Spillway: The bottom width of the trapezoidal earth spillway channel narrows from 15 feet at the crest to 10 feet at the dam axis. The slope of the channel upstream of the dam axis is 2%.

c. Reservoir Area: There are no upstream structures of significant influence on the rate and time of peak flood inflow into the reservoir. There are no visible indications to suggest drastic change in the prevailing watershed land use to significantly alter the hydrologic and hydraulic analysis summarized in paragraph 5.5.

d. Downstream Conditions: Two low hazard dams are located within a 1500-foot stretch of the stream below Ponderosa Pines Dam. The first low hazard dam is an earthfill embankment, 7 feet high and 210 feet long, including spillway. The spillway consists of a 7 foot long rectangular weir and a 4 foot long by 0.9 foot high rectangular orifice whose crest elevation is 1.4 feet below the crest of the weir. The low point on top of the dam is 1.8 feet above the normal pool. Three seasonally occupied dwellings, whose first floor elevation is 1.2 feet to 2.9 feet above the crest of the dam, are located near the dam's abutments. The observed downstream conditions indicate that a high hazard classification is warranted for Ponderosa Pines Dam.

5.4 Method of Analysis.

Hydrologic and hydraulic evaluation was made in accordance with the procedures and guidelines established by the U.S. Army, Corps of Engineers, Baltimore District, Phase I Safety Inspection of Dams. The analysis has

been performed utilizing the HEC-1DB program developed by the U.S. Army Corps of Engineers, Hydrologic Engineering Center, Davis, California. A brief description of program capabilities, as well as the input and output data used specifically for this analysis, is presented in Appendix D.

5.5 Summary of Analysis.

a. Spillway Design Flood: According to criteria established by the Office of the Chief of Engineers (OCE), the Spillway Design Flood (SDF) for the size (small) and hazard potential (high) of the Ponderosa Pines Dam is between the one-half Probable Maximum Flood (1/2 PMF) and the full PMF. Because of the small storage capacity in the reservoir, the 1/2 PMF is selected as the SDF for the Ponderosa Pines Dam.

b. Results of Analysis: Pertinent results are tabulated in Appendix D. Ponderosa Pines Dam was evaluated for the normal reservoir pool level at elevation 1405.0, which is the prevailing condition during the spring and summer months of each year. Since the outlet works inlet is plugged during the aforementioned period, flow through the outlet works was excluded from the evaluation of spillway adequacy. The present spillway capacity of 75 cfs is equivalent to the reservoir outflow during flood magnitude of 15% of the PMF. The derived peak inflow for the selected SDF is 470 cfs. Overtopping analysis indicates overtopping depths of 0.39, 0.60 and 0.81 feet for flood magnitudes of 20%, 30% and 50% of the PMF, respectively. The duration of overtopping for the aforementioned floods is 4, 5.5 and 7.25 hours, respectively. It was judged that the dam cannot withstand the depth and duration of overtopping resulting from flood magnitude of 0.3 PMF without failure.

The results of the dam breach analysis indicate that the maximum outflow at failure for the 0.3 PMF is approximately 5500 cfs. When this flow is routed over the downstream dam, the flood stage is increased by 2.75 feet over the water surface that would have occurred had the dam not failed. This increase in flood stage constitutes a serious hazard to property and loss of life downstream of the dam.

c. Spillway Adequacy: Because the spillway capacity will not pass the SDF without overtopping the dam and because the dam may fail during flood magnitudes of less than 1/2 PMF and thereby increase the hazard to life and property downstream, the spillway is rated as seriously inadequate.

SECTION 6

EVALUATION OF STRUCTURAL STABILITY

6.1 Visual Observations.

The visual inspection of Ponderosa Pines Dam is described in Section 3. The erosion of the downstream slope of the dam, below the outlet works, the steepness of the downstream slope and the point source leakage below the toe are of concern. However, there is no visible evidence to indicate structural instability at the present time.

6.2 Design and Construction Data.

There are no documented design or construction data.

6.3 Past Performance.

The dam has performed adequately in the past. No documentation regarding overtopping of the dam was available.

6.4 Stability.

a. Static: The dam is considered to be stable under static loading conditions.

b. Seismic: The dam is located in seismic zone 1. In this zone, if the dam has adequate structural stability under static conditions, it is assumed to be able to withstand the minor seismic forces expected in this zone.

SECTION 7

ASSESSMENT AND RECOMMENDATION FOR REMEDIAL MEASURES

7.1 Dam Assessment.

a. Safety:

1. Based on visual inspection, field survey and calculations, Ponderosa Pines Dam is judged to be in poor condition. Based on the high hazard classification of the dam and in accordance with the recommended guidelines, the Spillway Design Flood (SDF) varies between the one-half of the Probable Maximum Flood (1/2 PMF) and the full PMF. Because of the small storage capacity in the reservoir, the 1/2 PMF is selected for the SDF. Results of the hydrologic and hydraulic analysis indicate that the derived peak inflow into the reservoir at the selected SDF is 470 cfs (cubic feet per second). The present spillway capacity of 75 cfs is equivalent to a flood magnitude of approximately 15% of the PMF. The dam will overtop by flood magnitudes less than the SDF. Overtopping depths of 0.6 and 0.8 foot was derived for flood magnitudes of 30% and 50% of the PMF. The duration of overtopping for the aforementioned floods is 5.5 and 7.25 hours, respectively. It was judged that the dam cannot withstand the depth and duration of overtopping resulting from flood magnitude of 0.3 PMF without failure. Failure of the dam will increase the downstream hazard to loss of life.

As the spillway cannot pass the 1/2 PMF without overtopping the dam and since overtopping at less than 1/2 PMF would cause failure which would significantly increase hazard to loss of life downstream, the spillway capacity is seriously inadequate and the facility is rated unsafe, non-emergency.

2. Although there is no visible evidence of structural instability, the erosion of the downstream slope below the outlet pipe and the leakage below the toe of the dam are of concern. Should the observed erosion and leakage remain unchecked it could, in time, affect the structural integrity of the dam.

3. The invert elevation of the outlet pipe is but 2.1 feet below the spillway crest. There are no means to lower the reservoir level below the present level of the pipe inlet in case of emergency.

4. The maintenance of the dam is limited to mowing grass on the crest and portion of the upstream slope of the embankment. The balance of the dam is poorly maintained, as indicated by the trees and brush on the downstream slope and at the toe of the dam, as well as by the existence of erosion scarps below the outlet pipe.

5. There is no warning system and evacuation plan in effect at the present time.

b. Adequacy of Information: The data collected from previously cited dam inspection reports, past performance, visual inspection and computations performed as part of this study are sufficient for Phase I dam safety assessment.

c. Urgency: The recommendations in Paragraph 7.2 should be implemented immediately.

d. Necessity for Further Investigations: In order to accomplish some of the remedial measures outlined in Paragraph 7.2, further investigations by a Professional Engineer, experienced in the design and construction of dams, will be necessary.

7.2 Recommendations and Remedial Measures.

a. The following investigations and remedial measures are recommended for immediate implementation by the owner:

(1) Engage a Professional Engineer, experienced in the design and construction of dams, to perform additional hydrologic and hydraulic analysis to more accurately determine the required spillway capacity. As a result of the analysis, design and construct a spillway that will pass the required SDF without overtopping the dam.

(2) Repair the erosion scarp and replace the displaced splash slab below the outlet pipe.

(3) Develop a method to draw down the reservoir in emergencies.

(4) Remove trees and brush from the downstream slope and the toe of the embankment under the supervision of a Professional Engineer.

(5) Monitor the rate and clarity of the point source leakage and any changes in the extent of the wet area below the toe of the dam and take appropriate action as required.

(6) Observe the presently unprotected upstream slope for wave erosion damage and repair as necessary.

b. In addition, it is recommended that the owner take the following precautionary operation and maintenance measures:

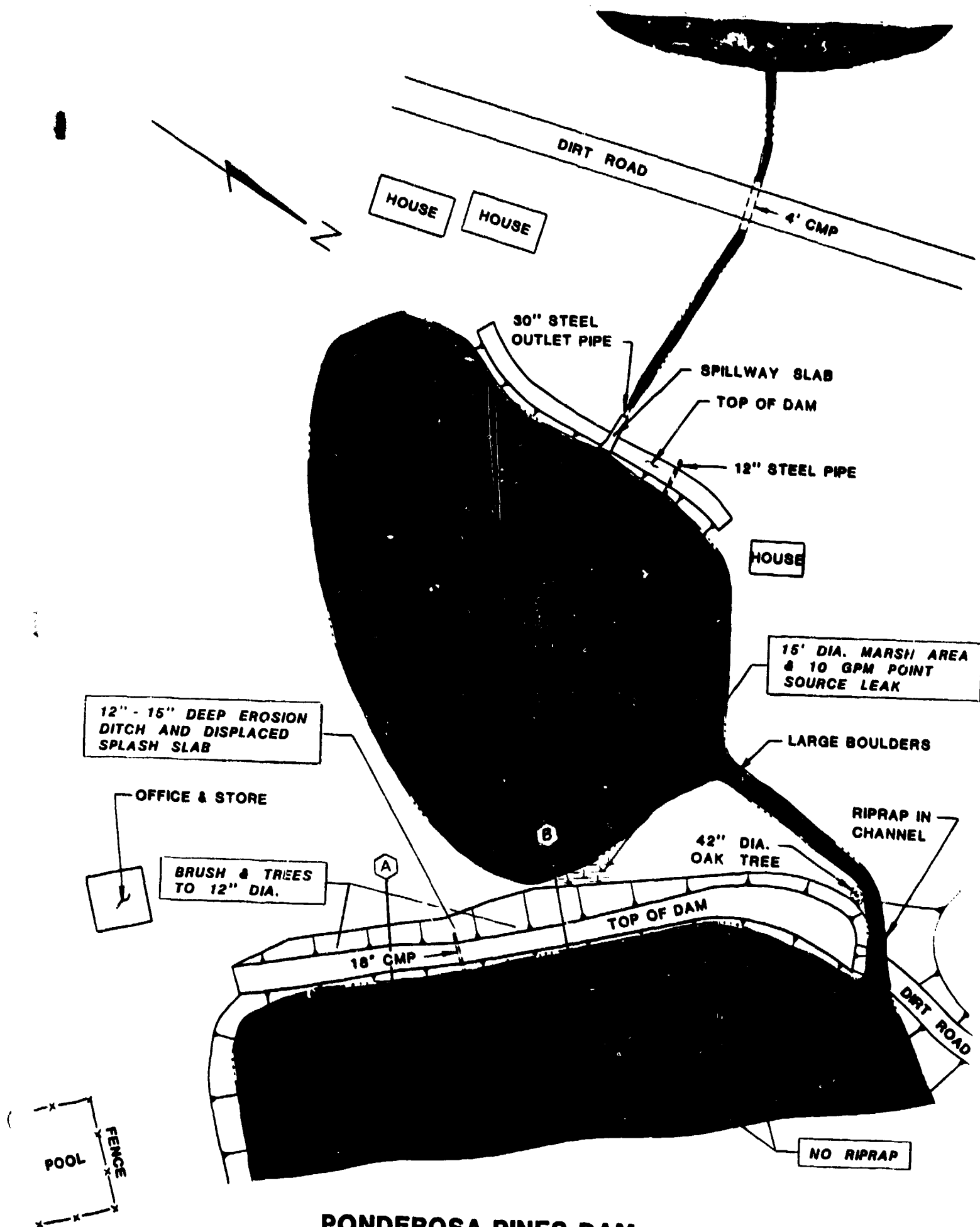
(1) Develop a detailed emergency operation procedure and warning system to facilitate timely and orderly evacuation of the downstream population if any hazardous conditions at the dam are observed.

(2) When warnings of a storm of major proportions are given by the National Weather Service, activate the emergency operation and warning system procedures.

(3) After satisfactory implementation of the remedial measures resulting from the recommended additional investigations, institute a formal inspection and maintenance program for the dam. As presently required by the Bureau of Dams and Waterway Management of PENNDER, the program shall include an annual inspection of the dam by a Professional Engineer, experienced in the design and construction of dams. Deficiencies found during annual inspections should be remedied as necessary.

APPENDIX A

VISUAL INSPECTION - CHECKLIST AND FIELD SKETCHES



**PONDEROSA PINES DAM
GENERAL PLAN - FIELD INSPECTION NOTES**

GEO-TECHNICAL SERVICES
Consulting Engineers & Geologists

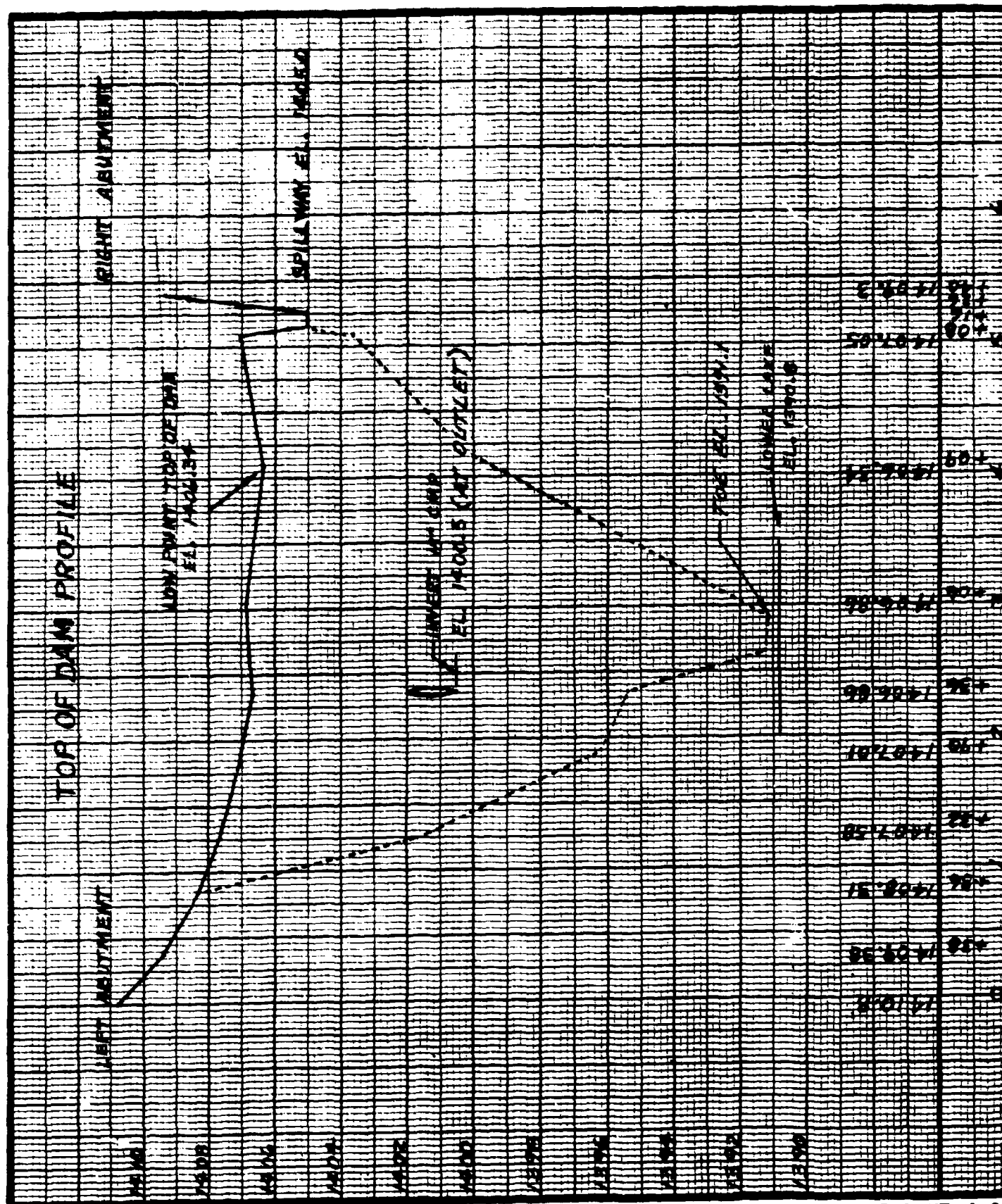
JOB FUNKEVONDA RINES DAM

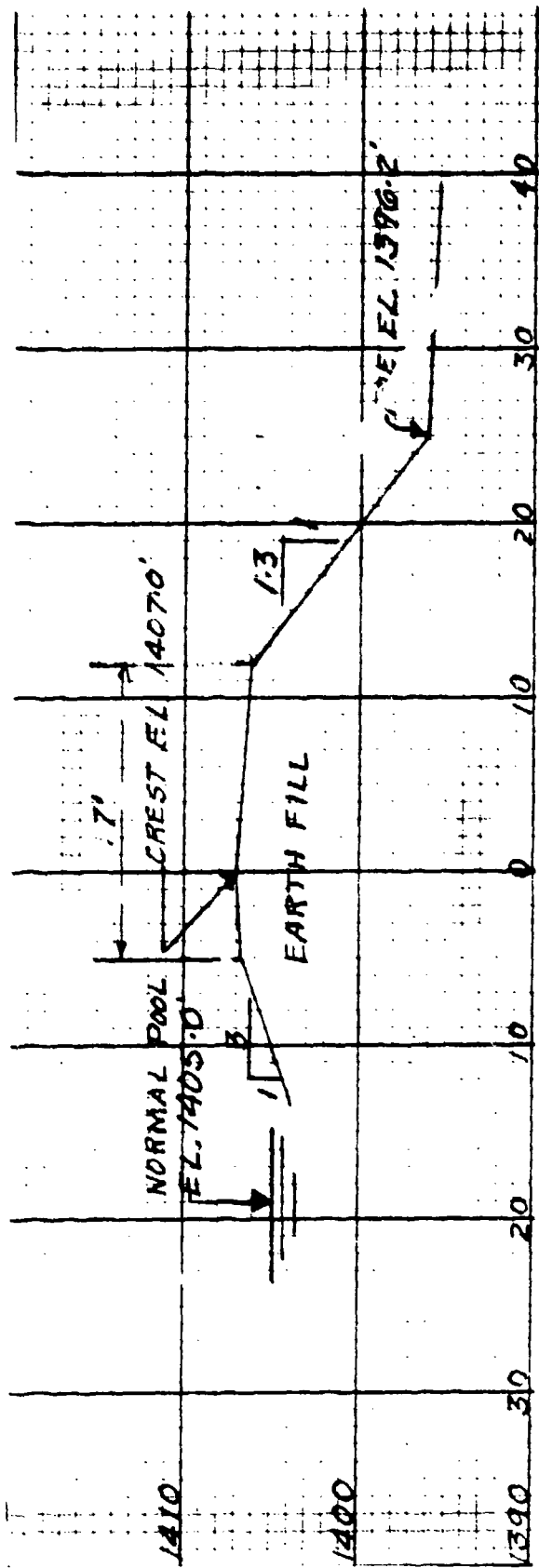
SHEET NO 1 OF 1

CALCULATED BY RJM DATE 7-21-81

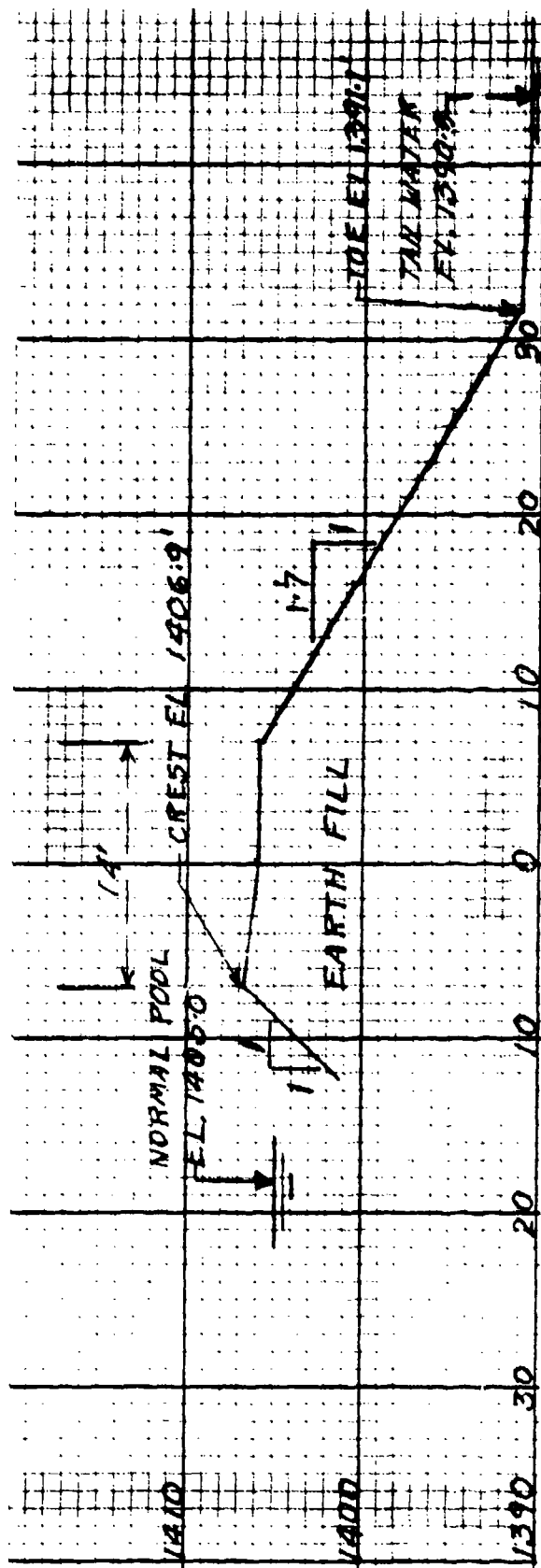
CHECKED BY _____ DATE _____

SCALE HORIZ. 1" = 100' VERT. 1" = 4'

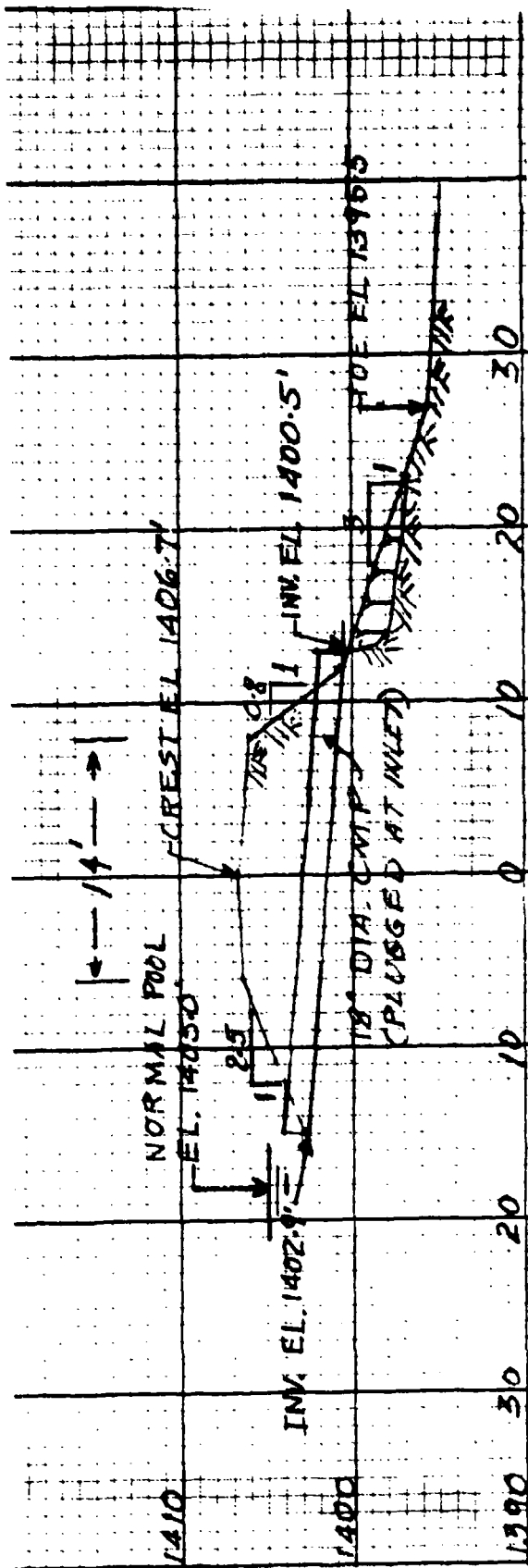




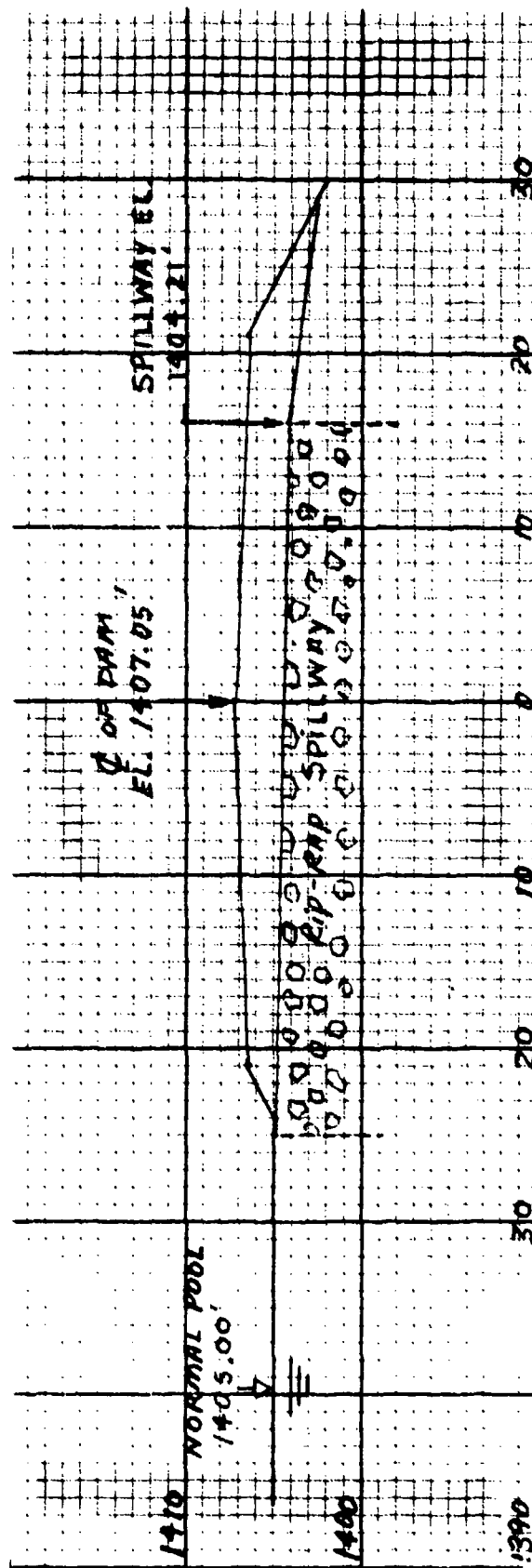
SECTION A



SECTION B



OUTLET PIPE



SPILLWAY SECTION

CHECK LIST VISUAL INSPECTION PHASE 1

NAME OF DAM Ponderosa Pines STATE Pennsylvania COUNTY Wayne
 NDI # PA -- 00304 PENNER # 64-204
 TYPE OF DAM Earthfill SIZE Small HAZARD CATEGORY High
 DATE(S) INSPECTION June 25, 1981 WEATHER Cloudy w/lt. rain TEMPERATURE 28°C @ 10:00 a.m.
 POOL ELEVATION AT TIME OF INSPECTION 1405.0 M.S.L.
 TAILWATER AT TIME OF INSPECTION 1390.8 M.S.L.

INSPECTION PERSONNEL

James Diaz, Geologist
 Gideon Yachin, Engineer
 Ronald Mather, Surveyor

OWNER REPRESENTATIVES

Peter Grimm, Owner
 Milton Roegner, Owner

OTHERS

RECORDED BY James Diaz

EMBANKMENT

| ITEM | OBSERVATIONS/REMARKS/RECOMMENDATIONS | NDI# PA - 00304 |
|--|---|-----------------|
| SURFACE CRACKS | None | |
| UNUSUAL MOVEMENT OR CRACKING AT OR BEYOND THE TOE | None | |
| SLOUGHING OR EROSION OF EMBANKMENT AND ABUTMENT SLOPES | Some erosion ditches (12 to 15 inches deep) along and below 18" CMP outlet pipe on steep downstream slope. Large sandstone splash pad below pipe is undercut and displaced. | |
| VERTICAL AND HORIZONTAL ALIGNMENT OF THE CREST | Good. Curve at right end of dam constructed to provide spillway approach channel and/or to protect 42" diameter oak tree on right abutment. | |
| RIPRAP FAILURES | No riprap. | |
| JUNCTION OF EMBANKMENT AND ABUTMENT, SPILLWAY AND DAM | Good | |

EMBANKMENT

| ITEM | OBSERVATIONS/REMARKS/RECOMMENDATIONS | NOI# PA - 00304 |
|--|---|-----------------|
| DAMP AREAS IRREGULAR VEGETA- TION (LUSH OR DEAD PLANTS) | Wet marshy seepage area (15' diameter) with reed type plants at downstream toe near center of dam. | |
| ANY NOTICEABLE SEEPAGE | 10 GPM point source leak at toe of dam near center of above seepage area. Water is clear of sediments. | |
| STAFF GAGE AND RECORDER | None | |
| DRAINS | None | |
| ROCK OUTCROPS | None. Large sandstone boulders scattered on right abutment slope. | |
| TREES | Entire downstream slope covered with brush and trees to 12" diameter. | |

OUTLET WORKS

| ITEM | OBSERVATIONS/REMARKS/RECOMMENDATIONS | NDI# PA - 00304 |
|--|---|-----------------|
| INTAKE STRUCTURE | Cap on 11½" elbow at upstream end of 18" CMP outlet pipe. Lake lowered every fall to invert of this pipe. | |
| OUTLET CONDUIT (CRACKING AND SPALLING OF CON- CRETE SURFACES) | 18" diameter CMP. | |
| OUTLET STRUCTURE | None. Discharge from 18" CMP drops to large sandstone splash pad. Erosion scarps (12 to 15 inches deep) have undercut and displaced slab. | |
| OUTLET CHANNEL | Eroded gully (12 to 15 inches deep) below outlet pipe to toe of dam. | |
| GATE(S) AND OPERA- TIONAL EQUIPMENT | Cap on inlet pipe is removed every year (in the fall) to lower the lake level. | |
| | | |

EMERGENCY SPILLWAY

| ITEM | OBSERVATIONS/REMARKS/RECOMMENDATIONS | NDIS PA - 00304 |
|----------------------------------|---|-----------------|
| TYPE AND CONDITION | Excavated earth channel (10' wide) on the right abutment with riprap bottom in good condition. | |
| APPROACH CHANNEL | Approach channel with riprap bottom widens to 15' about 30 feet upstream of the control section. | |
| SPILLWAY CHANNEL AND SIDEWALLS | Trapezoidal section with earth side slopes and riprap bottom ends at toe of dam near 42" diameter oak tree on right abutment. | |
| STILLING BASIN PLUNGE POOL | None | |
| DISCHARGE CHANNEL | Earth bottom with trees and scattered large sandstone boulders. | |
| BRIDGE AND PIERS EMERGENCY GATES | None | |

SERVICE SPILLWAY - NONE

| ITEM | OBSERVATIONS/REMARKS/RECOMMENDATIONS | NDI# PA - 00304 |
|--------------------|--------------------------------------|-----------------|
| TYPE AND CONDITION | None | |
| APPROACH CHANNEL | None | |
| OUTLET STRUCTURE | None | |
| DISCHARGE CHANNEL | None | |
| | | |
| | | |

INSTRUMENTATION

| ITEM | OBSERVATIONS/REMARKS/RECOMMENDATIONS | NDI# PA - 00304 |
|-----------------------|--------------------------------------|-----------------|
| MONUMENTATION SURVEYS | None | |
| OBSERVATION WELLS | None | |
| WEIRS | None | |
| PIEZOMETERS | None | |
| OTHERS | None | |
| | | |

RESERVOIR AREA AND DOWNSTREAM CHANNEL

| ITEM | OBSERVATIONS/REMARKS/RECOMMENDATIONS | NDI# PA-00304 |
|---|---|---------------|
| SLOPES: RESERVOIR | Wooded slopes of 15 to 20 percent on right abutment. Partly wooded slopes of less than 8% on left abutment. There are no slope conditions that would affect the safety of the dam. | |
| SEDIMENTATION | None | |
| DOWNSTREAM CHANNEL (OBSTRUCTIONS, DEBRIS, ETC.) | The dam of Middle Lake backs water to toe of dam. Three buildings (seasonal occupancy) on both abutments of Middle Lake Dam (Owned by Pondrosa Pines). The channel above the 4' CMP road culvert is filled with brush. | |
| SLOPES: CHANNEL VALLEY | Downstream of 4' CMP culvert the valley floor widens to form the Lower Lake (owned by Sally Moore). | |
| APPROXIMATE NUMBER OF HOMES AND POPULATION | Three seasonally occupied buildings. On the left abutment of the Middle Lake Dam, the house and sales office floor is 1.2' above top of dam and the floor of the duplex type building is 2.9' above top of dam. On the right abutment of Middle Lake Dam, the lower living level of the seasonal home is 1.2' above top of dam. | |

APPENDIX B

ENGINEERING DATA - CHECKLIST

**CHECK LIST
ENGINEERING DATA
PHASE I**

NAME OF DAM Ponderosa Pines

| ITEM | REMARKS | NDIP PA - 00304 |
|---|--|-----------------|
| PERSONS INTERVIEWED AND TITLE | Peter Grimm and Milton Roegner, Owners | |
| REGIONAL VICINITY MAP | See Exhibit E-1, Appendix E | |
| CONSTRUCTION HISTORY | Information is not available. Present owners purchased dam in 1975 and report that the dam existed prior to 1970. | |
| AVAILABLE DRAWINGS | None available | |
| TYPICAL DAM SECTIONS | See Exhibit A-3, Appendix A | |
| OUTLETS PLAN DETAILS DISCHARGE RATINGS | See Exhibit A-1, Appendix A See Exhibit A-4, Appendix A At W.S. El. 1402.9 no discharge; 12cfs at Max. Pool. | |

**CHECK LIST
ENGINEERING DATA
PHASE I
(CONTINUED)**

| ITEM | REMARKS | NDIN PA - 00304 |
|---|---|-----------------|
| SPILLWAY: PLAN SECTION DETAILS | See Exhibit A-1, Appendix A See Exhibit A-2, Appendix A See Exhibit A-4, Appendix A | |
| OPERATING EQUIP- MENT PLANS AND DETAILS | There is no operating equipment servicing the facility | |
| DESIGN REPORTS | None available | |
| GEOLOGY REPORTS | None available | |
| DESIGN COMPUTATIONS: HYDROLOGY AND HYDRAULICS STABILITY ANALYSES SEEPAGE ANALYSES | None available | |
| MATERIAL INVESTIGATIONS: BORING RECORDS LABORATORY TESTING FIELD TESTING | None available | |

**CHECK LIST
ENGINEERING DATA
PHASE I
(CONTINUED)**

| ITEM | REMARKS | NDH# PA - 00304 |
|--|---|-----------------|
| BORROW SOURCES | Not known | |
| POST CONSTRUCTION DAM SURVEYS | None available | |
| POST CONSTRUCTION ENGINEERING STUDIES AND REPORTS | None available | |
| HIGH POOL RECORDS | None available. No overtopping since the acquisition of the facilities by the owners in 1975. | |
| MONITORING SYSTEMS | None | |
| MODIFICATIONS | Not known | |

**CHECK LIST
ENGINEERING DATA
PHASE I
(CONTINUED)**

| ITEM | REMARKS | NDI# PA - 00304 |
|--|---|-----------------|
| PRIOR ACCIDENTS OR FAILURES | Information is not available | |
| MAINTENANCE RECORDS MANUAL | None available | |
| OPERATION RECORDS MANUAL | None available | |
| OPERATIONAL PROCEDURES | Self-regulating in spring and summer months. Reservoir level is lowered by a maximum of 2.1 feet in the fall of each year by removing cap from the inlet of 18" CMP | |
| WARNING SYSTEM AND/OR COMMUNICATION FACILITIES | None in effect | |
| MISCELLANEOUS | | |

**CHECK LIST
HYDROLOGIC AND HYDRAULIC
ENGINEERING DATA**

NDI ID # 00304
PENNER ID # 64-204

SIZE OF DRAINAGE AREA: 0.27 square mile
ELEVATION TOP NORMAL POOL: 1405.0 STORAGE CAPACITY 51 acre-feet
ELEVATION TOP FLOOD CONTROL POOL: NA STORAGE CAPACITY: NA
ELEVATION MAXIMUM DESIGN POOL: Unknown STORAGE CAPACITY: NA
ELEVATION TOP DAM: 1406.3* STORAGE CAPACITY: 67 acre-feet
*Lowest crest elevation

SPILLWAY DATA

CREST ELEVATION: At inlet of approach channel 1405 (feet above m.s.l.)
At control section 1404.8 (near axis of dam)
TYPE: An earth channel having a trapezoidal cross section
CREST LENGTH: 15 feet at inlet from reservoir; 10 feet at $\frac{1}{2}$ Dam
CHANNEL LENGTH: 190 feet (Including 26' approach channel)
SPILLOVER LOCATION: At the right abutment
NUMBER AND TYPE OF GATES: None

OUTLET WORKS

TYPE: 18" Dia. CMP
LOCATION: Approximately 150 feet from Left abutment
ENTRANCE INVERTS: 1402.9
EXIT INVERTS: 1400.5
EMERGENCY DRAWDOWN FACILITIES: None below Elevation 1402.9

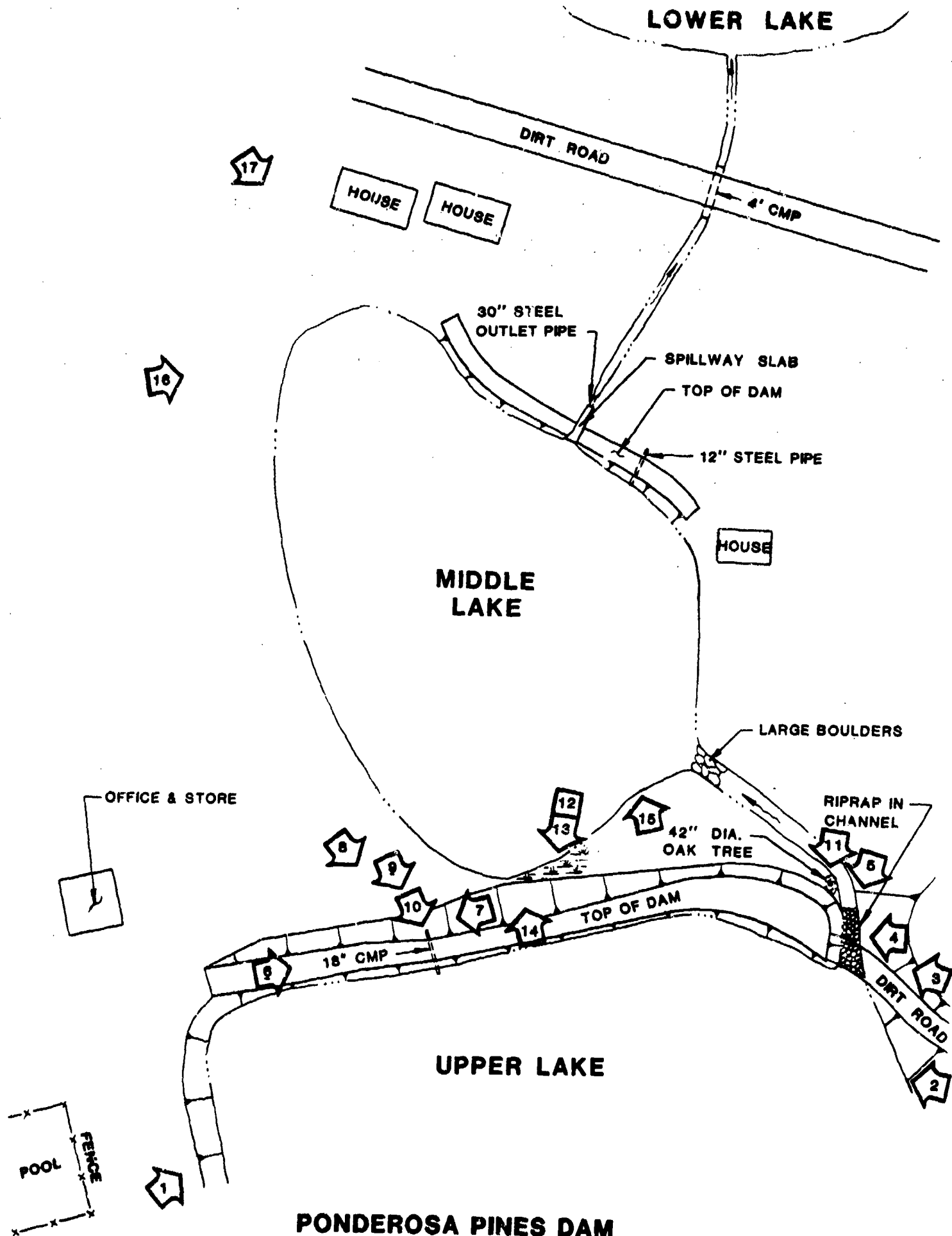
HYDROMETEOROLOGICAL GAGES

TYPE: None
LOCATION: NA
RECORDS: NA

MAXIMUM NON-DAMAGING DISCHARGE: 75 cfs

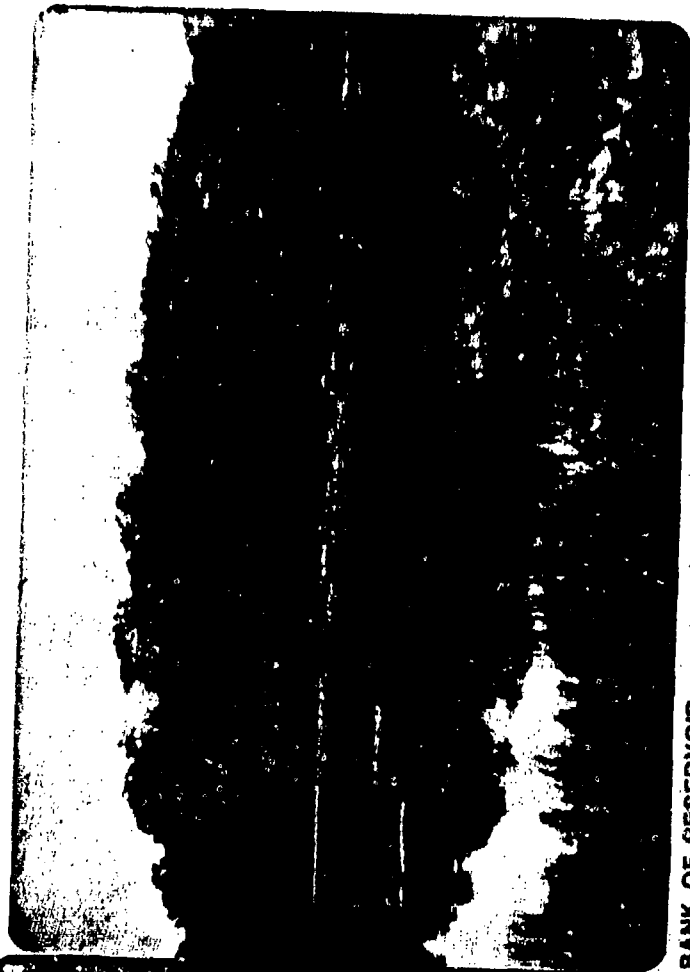
APPENDIX C

PHOTOGRAPHS

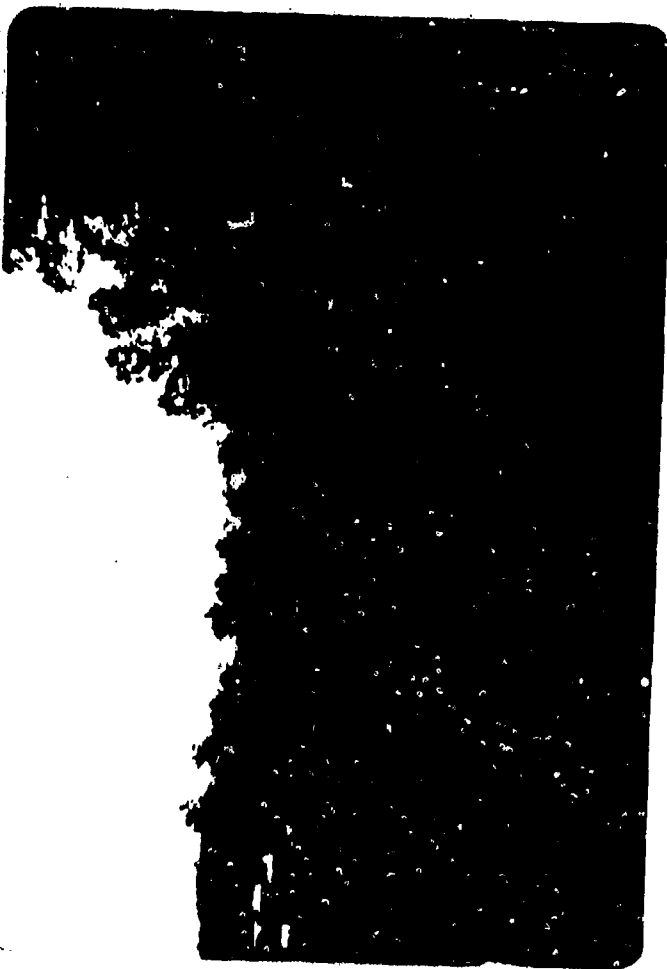


**PONDEROSA PINES DAM
PHOTOGRAPHS LOCATION MAP**

EXHIBIT C-1



1. VIEW FROM LEFT BANK OF RESERVOIR



2. LEFT ABUTMENT (AT LEFT OF PHOTO)



3. RIGHT ABUTMENT (SPILLWAY, SEE ARROW)



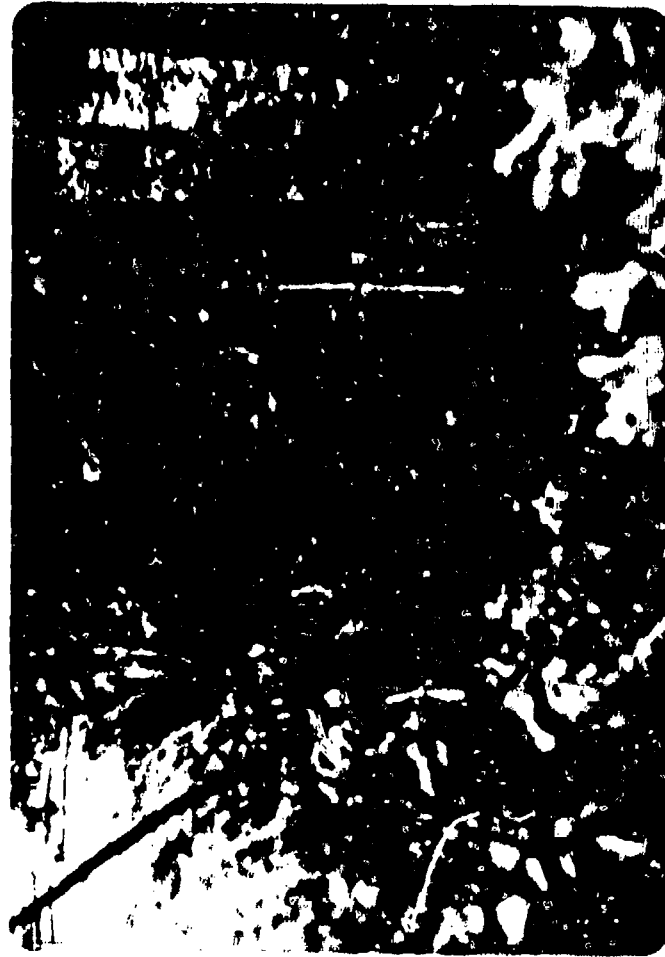
4. SPILLWAY AND RIGHT ABUTMENT



6. DAM CREST, LOOKING TOWARD RT. ABUTMENT



5. UPSTREAM VIEW OF SPILLWAY CHANNEL



7. DOWNSTREAM SLOPE, FACING LEFT ABUTMENT



8. DOWNSTREAM SLOPE OF DAM(TYPICAL)



9. OUTLET PIPE(SEE INSERT AT RIGHT)



10. 18" DIA. CMP OUTLET PIPE

DOWNSTREAM FACE OF DAM



11. 42" DIA. OAK AT TOE OF DAM
(SPILLWAY, LEFT OF TREE)



12. DOWNSTREAM SLOPE AT CENTER OF DAM
(SEEPAGE AT ARROW, SEE INSERT)



13. INSERT (SHOWING SEEPAGE)

DOWNSTREAM FACE OF DAM



14. DOWNSTREAM VIEW FROM DAM CREST



15. CREST OF DOWNSTREAM POND EMBANKMENT



16. DOWNSTREAM DAM, LEFT ABUTMENT



17. DOWNSTREAM DAM VIEW FROM LEFT ABUTMENT
(PONDEROSA PINES DAM, RIGHT OF PHOTO)

DOWNSTREAM HAZARD

APPENDIX D

HYDROLOGY AND HYDRAULICS

SUMMARY DESCRIPTION
OF
FLOOD HYDROGRAPH PACKAGE (HEC-1)
DAM SAFETY INVESTIGATIONS

The hydrologic and hydraulic evaluation for this inspection report has employed computer techniques using the Corps of Engineers computer program identified as the Flood Hydrograph Package (HEC-1) Dam Safety Version.

The program has been designed to enable the user to perform two basic types of hydrologic analyses: (1) the evaluation of the over-topping potential of the dam, and (2) estimate the downstream hydrologic-hydraulic consequences resulting from assumed structural failures of the dam. A brief summary of the computation procedures typically used in the dam over-topping analysis is shown below.

- Development of an inflow hydrograph to the reservoir.
- Routing of the inflow hydrograph(s) through the reservoir to determine if the event(s) analyzed would over-top the dam.
- Routing of the outflow hydrograph(s) of the reservoir to desired downstream locations. The results provide the peak discharge, time of the peak discharge and maximum stage of each routed hydrograph at the outlet of the reach.

The output data provided by this program permits the comparison of downstream conditions just prior to a breach failure with that after a breach failure and the determination as to whether or not there is a significant increase in the hazard to loss of life as a result of such a failure.

The results of the studies conducted for this report are presented in Section 5.

For detailed information regarding this program, refer to the Users Manual for the Flood Hydrograph Package (HEC-1), Dam Safety Investigations prepared by the Hydrologic Engineering Center, U.S. Army Corps of Engineers, Davis, California.

GEO-TECHNICAL SERVICES
Consulting Engineers & Geologists

JOB PONDEROSA PINES DAM TA-0304

SHEET NO. _____ OF _____

CALCULATED BY _____ DATE _____

CHECKED BY _____ DATE _____

SCALE _____

- 1.) DEVELOP INFLOW HYDROGRAPH TO PONDEROSA PINES LAKE
- 2.) ROUTE THRU PONDEROSA PINES LAKE
- 3.) ROUTE THRU DOWNSTREAM RESERVOIR
- 4.) PERFORM BREACH ANALYSIS TO DETERMINE EFFECT ON DOWNSTREAM RESERVOIR.

GEO-TECHNICAL SERVICES
Consulting Engineers & Geologists

JOB PONDAROSA RUNS

SHEET NO. 1 OF 1

CALCULATED BY SPM DATE 5/81

CHECKED BY SPM DATE 5/81

SCALE 1" = 100'

GENERAL DATA

| | |
|----------------------------|--|
| RIVER BASIN STREAM NAME | DELAWARE UNNAMED TRIB. TO LACKAWAXEN RIVER |
| NDI I.D. NO | PA-0304 |
| DER I.D. NO | 64-204 |
| OWNER | P. GRIMM |
| LOCATION | DYBERRY TWP. |
| CO. | WAYNE |
| QUAD. | ALDENVILLE, PA. |
| LAT. | 41-39-30 |
| LONG. | 75-20-05 |
| SIZE | Small |
| HAZARD | HIGH |
| DRAINAGE AREA | 0.27 mi ² |

Watershed Features

GEO-TECHNICAL SERVICES
Consulting Engineers & Geologists

JOB CONCRETE DAM, MA-0206

SHEET NO. _____ OF _____

CALCULATED BY WEH DATE 7/22/81

CHECKED BY _____ DATE _____

SCALE _____

PONDEROSA PINES DAM

DRAINAGE BASIN & UNIT HYDROGRAPH DATA

DRAINAGE AREA 0.27 Sq. Mi.

SNYDER UNIT HYDROGRAPH COEFFICIENTS
AS SUPPLIED BY BALT. DIST. COE (DELAWARE BASIN ZONE 1)

$C_p = 0.45$

$C_t = 1.23$

LAG TIME = $C_t (L \times L_{ca})^{0.3}$

$L = 0.59$ mi. RESERVOIR OUTLET TO DRAINAGE DIVIDE

$L_{ca} = 0.22$ mi. RESERVOIR OUTLET TO CENTROID

$$\therefore T_p = 1.23 (0.59 \times 0.22)^{0.3} = 0.67 \text{ HRS}$$

RAINFALL DATA

PER HYDROMETEOROLOGICAL REPORT No. 33 ZONE 1

PMF RAINFALL = 21.8" (24 HR & 200 Sq. Mi.)

RAINFALL DISTRIBUTION

| | |
|-------|------|
| 6 HR | 111% |
| 12 HR | 123% |
| 24 HR | 133% |
| 48 HR | 142% |

GEO-TECHNICAL SERVICES
Consulting Engineers & Geologists

JOB POUNDEROSA PINES DAM EA-0224

SHEET NO. _____ OF _____

CALCULATED BY WEH DATE 7/23/81

CHECKED BY _____ DATE _____

SCALE _____

POUNDEROSA PINES DAM (CONT.)

DAM DATA

TOP OF DAM ELEV. (LOW POINT) 1406.3
DAM LENGTH (INC. SPILLWAY) 450'
DAM HEIGHT 15.2'
DAM WIDTH VARIES

NON-LEVEL DAM

| LENGTH OF DAM | BELON ELEV. |
|------------------|----------------|
| 0' | 1406.3 |
| 90' | 1406.6 |
| 250' | 1406.8 |
| 320' | 1407.0 |
| 380' | 1407.6 |
| 470' | 1409.4 |
| 510' | 1410.8 |

SPILLWAY DATA

COMPUTE RATING CURVE & INPUT DIRECTLY

GEO-TECHNICAL SERVICES
Consulting Engineers & Geologists

JOB NDT - PA

SHEET NO. _____

OF _____

CALCULATED BY _____

DATE _____

CHECKED BY _____

DATE _____

PONDEROSA PINES

SPILLWAY & OUTLET RATING (PONDEROSA PINES DAM.)

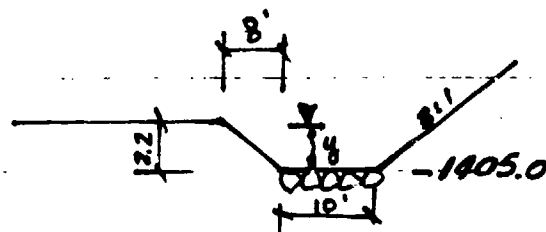
18" LOW LEVEL OUTLET IS BLOCKED

USE SPILLWAY ONLY

SPILLWAY SLOPE $\frac{0.8'}{40'} = 2\%$

ASSUME CRITICAL DEPTH CONTROL IN TRAPEZOIDAL SECTION

SPILLWAY WIDTH VARIES - USE NARROWEST SECTION



$$Q = \sqrt{\frac{A^3 g}{T}}$$

$$\text{Pool El.} = 1405 + y + \frac{Q^2}{2gA}$$

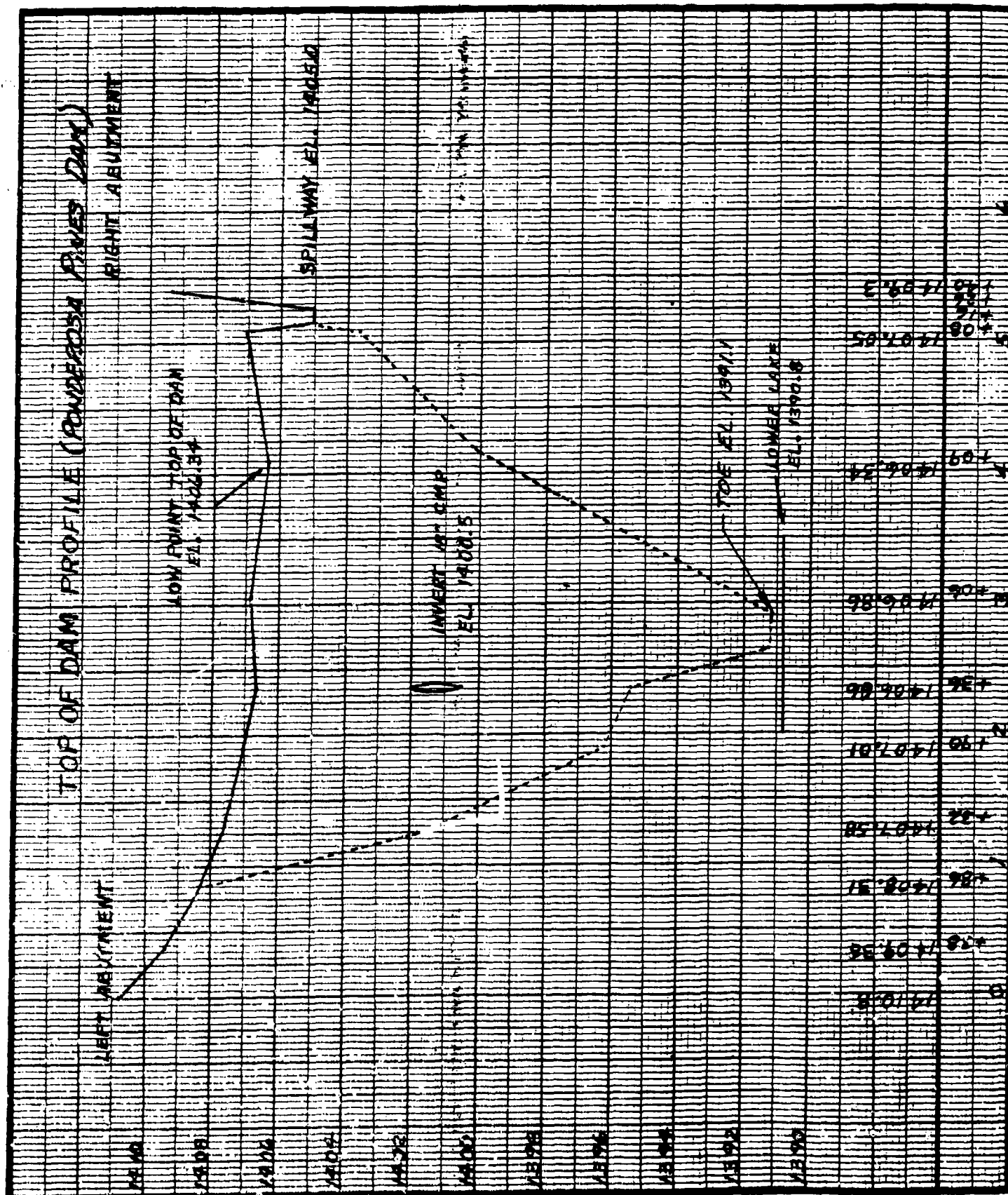
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10 REM *** PONDEROSA PINES SPILLWAY RATING ***
20 B=10:Z=(3.0+3.6)/2:E0=1405.0
30 FOR Y=.25 TO 4 STEP .50
40 Y1=Y-2.2:A1=Y1*Y1*Z/2:IF Y>2.2 THEN 50:A1=0
50 A=(B+Y*Z)*Y-A1:T=B+2*Y*Z-A1*2/Y1
60 Q=SQR(32.2*A*A*A/T)
70 V=Q/A:E=E0+Y+V*V/64.4
80 PRINT USING 100,INT(E/.1+.5)*.1,INT(Q+.5)
90 NEXT Y
100Z #####

```

| ELEV. | FLOW |
|--------|------|
| 1405.0 | 0 |
| 1405.4 | 7 |
| 1406.1 | 42 |
| 1406.7 | 99 |
| 1407.4 | 177 |
| 1408.0 | 280 |
| 1408.7 | 414 |
| 1409.4 | 569 |
| 1410.1 | 745 |

SHEET NO. 1 OF 1
CALCULATED BY RJM DATE 7-21-81
CHECKED BY _____ DATE _____
SCALE HORIZ. 1" = 100' VERT. 1" = 4'



D-8

GEO-TECHNICAL SERVICES
Consulting Engineers & Geologists

JOB PONDEROSA PINES DAM TA-0304

SHEET NO. _____ OF _____

CALCULATED BY WEH DATE 7/23/81

CHECKED BY _____ DATE _____

SCALE _____

PONDEROSA PINES DAM (CONT.)

ESTIMATE BOTTOM @ ELEV. 1390.0

AREA @ NORMAL POOL = 10.1 AC

AREA @ 1410.0 CONTOUR = 30.0 AC

\therefore AREA @ LOWPOINT (1406.3) = $10.1 + \left(\frac{19.9}{5}\right)(1.3) = 15.3 \text{ AC}$

ELEV.

AREA

1390.0

0

1405.0

10.1

1406.3

15.3

1410.0

30.0

BOTTOM RESERVOIR

NORMAL

LOW POINT TOP OF DAM
CONTOUR

GEO-TECHNICAL SERVICES
Consulting Engineers & Geologists

JOB FOUNDER'S FILL DAM FA-0304

SHEET NO. _____ OF _____

CALCULATED BY WEH DATE 7/29/81

CHECKED BY _____ DATE _____

SCALE _____

ROUTE FLOW THRU UNNAMED DOWNSTREAM RESERVOIR
WITHOUT ADDING ADDITIONAL RUN-OFF

DAM DATA

TOP OF DAM ELEV. (LOW POINT) 1392.6
DAM LENGTH (INC. SPILLWAY) 210'
DAM HEIGHT 7'
DAM WIDTH 7'±
"C" VALUE - DAM 2.7
NON - LEVEL DAM

| LENGTH OF DAM | BELOW ELEV. |
|------------------|----------------|
| 0 | 1392.6 |
| 60 | 1392.8 |
| 145 | 1393.0 |
| 274 | 1393.2 |
| 321 | 1393.8 |
| 368 | 1395.4 |

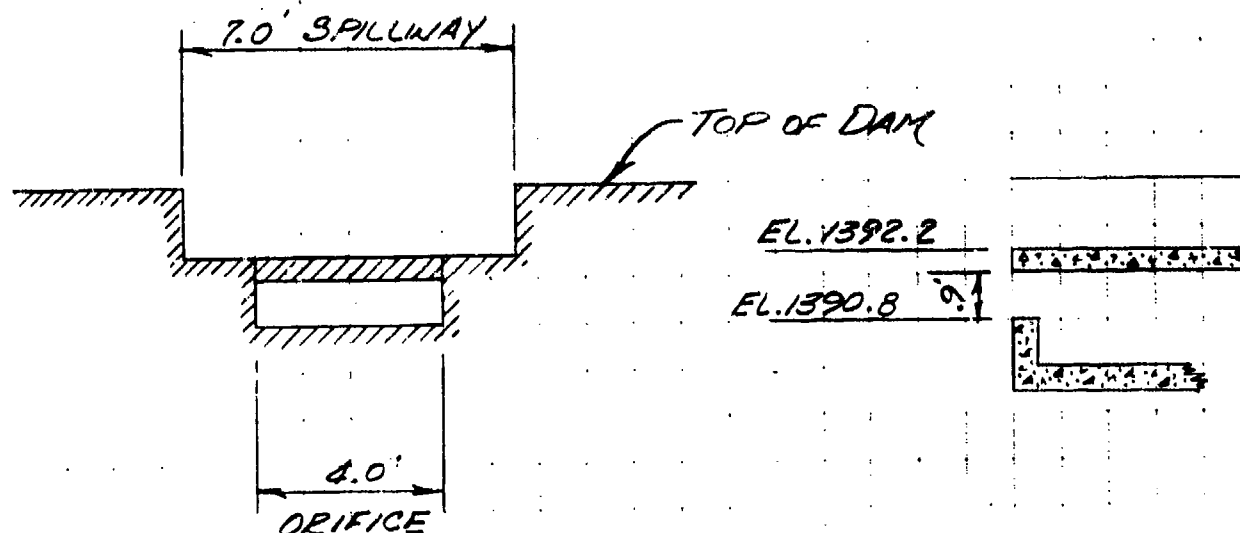
SPILLWAY DATA

COMPUTE RATING CURVE & INPUT DIRECTLY

GEO-TECHNICAL SERVICES
Consulting Engineers & Geologists

JOB WILLOW BROOK LANE DAM, FAIRFAX
SHEET NO. _____ OF _____
CALCULATED BY WEH DATE 7/24/81
CHECKED BY _____ DATE _____
SCALE _____

UNNAMED DOWNSTREAM DAM (CONT.)



ORIFICE FLOW = $Q_1 = C a \sqrt{2gh}$

$C = 0.7$
 $a = 3.6 \text{ SF}$
 $g = 32.2 \text{ FT./SEC}^2$
 $h = \text{DEPTH OF WATER ABOVE}$
 $\quad \& \text{ ORIFICE (W.S. - 1391.2)}$

SPILLWAY FLOW = $Q_2 = CLH^{3/2}$

$C = 2.9$
 $L = 7.0'$
 $H = (\text{W.S.} - 1392.2)$

GEO-TECHNICAL SERVICES
Consulting Engineers & Geologists

JOB TUNNEL LINED WITH TUNNEL

SHEET NO. _____ OF _____

CALCULATED BY WEH DATE 7/20/81

CHECKED BY _____ DATE _____

SCALE _____

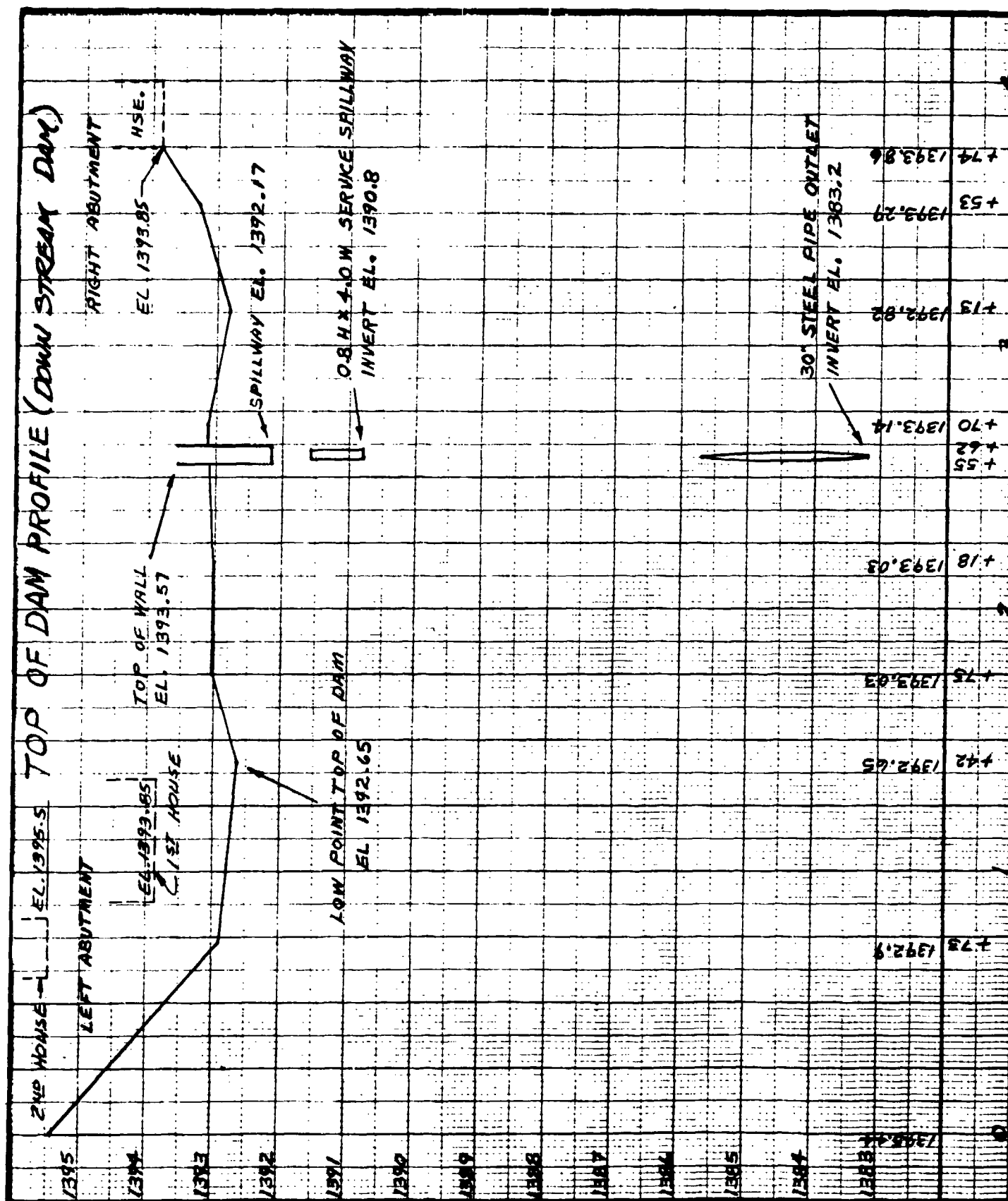
UNNAMED DOWNSTREAM DAM SPILLWAY RATING

| <u>W.S. ELEV.</u> | <u>h</u> | <u>H</u> | <u>Q_T</u> |
|-------------------|----------|----------|----------------------|
| 1390.8 | 0 | | 0 |
| 1391.6 | 0.4 | | 13 |
| 1392.2 | 1.0 | 0 | 20 |
| 1393.0 | 1.8 | 0.8 | 42 |
| 1394.0 | 2.8 | 1.8 | 83 |
| 1395.0 | 3.8 | 2.8 | 135 |
| 1396.0 | 4.8 | 3.8 | 195 |
| 1397.0 | 5.8 | 4.8 | 262 |
| 1398.0 | 6.8 | 5.8 | 336 |
| 1399.0 | 7.8 | 6.8 | 416 |

NOTE: SPILLWAY RATING CURVE TO BE
INPUT DIRECTLY

GEO-TECHNICAL SERVICES
Consulting Engineers & Geologists

JOB _____
SHEET NO 1 OF 1
CALCULATED BY RJM DATE 7-10-81
CHECKED BY _____ DATE _____
SCALE HORZ. 1" = 50' VERT. 1" = 2'



GEO-TECHNICAL SERVICES
Consulting Engineers & Geologists

JOB FOURTH STREET DAM MA-0304

SHEET NO. _____ OF _____

CALCULATED BY WEH DATE 7/24/81

CHECKED BY _____ DATE _____

SCALE _____

UNNAMED DOWNSTREAM DAM (CONT.)

ESTIMATE BOTTOM @ 1383.0

AREA @ NORMAL POOL (EL. 1390.8) = 1.7 AC

AREA @ 1400 CONTOUR = 5.7 AC

∴ AREA @ LOWPOINT (1392.6) = $1.7 + (4/9.2)(1.8) = 2.5 \text{ AC}$

| ELEV. | AREA | |
|--------|------|-------------------|
| 1383.0 | 0 | BOTTOM RESERVOIR |
| 1390.8 | 1.7 | NORMAL |
| 1392.6 | 2.5 | LOW POINT TOP DAM |
| 1400 | 5.7 | CONTOUR |

GEO-TECHNICAL SERVICES
Consulting Engineers & Geologists

JOB PONDEROSA FINES DAM LA-0509

SHEET NO. _____ OF _____

CALCULATED BY WEH DATE 7/28/81

CHECKED BY _____ DATE _____

SCALE _____

FROM THE OBSERVED FIELD CONDITIONS IT IS JUDGED THAT 6" OF WATER FLOWING OVER THE TOP OF THE DAM COULD CAUSE SERIOUS EROSION AND POSSIBLE DAM FAILURE. (PONDEROSA FINES DAM)

FROM THE RESULTS OF THE OVERTOPPING ANALYSIS, 30% OF THE PMF WOULD BE ENOUGH TO CAUSE THIS DEGREE OF OVERTOPPING. THEREFORE A BREACH ANALYSIS WAS PERFORMED FOR 0.3 PMF AND THE SDF OF 0.5 PMF.

TWO BREACH SIZES WERE ANALYZED, A 30' BOT. WIDTH AND A 60' BOT. WIDTH. BOTH BREACHES WERE ASSUMED TO HAVE SIDESLOPES OF 1V ON 1H AND A BOTTOM ELEV. AT ORIGINAL GROUND OF 1391.1. A 15 MIN. DURATION WAS USED FOR BOTH.

[illegible]

.....
 FLOOD HYDROGRAPH PACKAGE (HEC-1)
 DAM SAFETY VERSION JULY 1978
 LAST MODIFICATION 01 APR 80

RUN DATE= 01/07/22P.
 TIME= 07.37.09.

NATIONAL DAM INSPECTION PROGRAM
 PONDERSA PINES DAM--PA0304 (OVERLAPPING ANALYSIS)
 DYERLY TWP, WAYNE CO, PA.

| JOB SPECIFICATION | | | | | | | | | |
|-------------------|-----|------|-------|-----|-------|-------|------|------|-------|
| NO | NHR | NMTN | IDAY | IHR | IMIN | METRC | IPLT | IPRT | WSTAN |
| 150 | 0 | 15 | 0 | 0 | 0 | 0 | 0 | -4 | 0 |
| | | | JOPER | NWT | LROPT | TRACE | | | |
| | | | 5 | 0 | 0 | 0 | | | |

MULTI-PLAN ANALYSES TO BE PERFORMED

RTIOS= .10 .20 .30 .40 .50 .75 1.00
 NPLAN= 1 NRTIO= 7 LRTIO= 1

SUB-AREA RUNOFF COMPUTATION

INFLOW TO PONDERSA PINES (SUB-AREA 1)

| ISTAQ | ICOMP | IECON | ITYPE | JPLT | JPRT | INAME | ISTAGE | IAUTO |
|-------|-------|-------|-------|------|------|-------|--------|-------|
| 1 | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 0 |

HYDROGRAPH DATA

| IMYDG | IUNG | TAREA | SNAP | TRSDA | TRSPC | PATIO | ISNOW | ISAME | LOCAL |
|-------|------|-------|------|-------|-------|-------|-------|-------|-------|
| 1 | 1 | .27 | 0.00 | .27 | 0.00 | 0.000 | 0 | 1 | 0 |

PRECIP DATA

| SPFE | PMS | RA | R12 | R24 | RAH | R72 | R96 |
|------|-------|--------|--------|--------|--------|------|------|
| 0.00 | 21.00 | 111.00 | 123.00 | 133.00 | 142.00 | 0.00 | 0.00 |

TRSPC COMPUTED BY THE PROGRAM IS .450

| LOSS DATA | | | | | | | | | | |
|-----------|-------|-------|-------|-------|------|-------|-------|-------|-------|-------|
| LROPT | STPKR | DLTRP | RTIOL | ERAIN | STRS | RTIOK | STRTL | CNSTL | ALSNW | RTIMP |
| 0 | 0.00 | 0.00 | 1.00 | 0.00 | 0.00 | 1.00 | 1.00 | .05 | 0.00 | 3.00 |

UNIT HYDROGRAPH DATA
 TPE= .67 CP= .45 NTA= 0

PRECSSION DATA

STPTOE= -1.00 ORCSNE= -.05 RTIORE= 2.00

| UNIT HYDROGRAPH 25 SEC-OF-PERIOD COORDINATES, LAGE | | | | | | | | | |
|--|-----|------|------|-----|-----|-----|-----|-----|-----|
| 24. | 79. | 111. | 100. | 79. | 63. | 50. | 39. | 31. | 25. |
| 20. | 10. | 10. | 10. | 8. | 6. | 5. | 4. | 3. | 2. |
| 7. | 2. | 1. | 1. | 1. | 1. | 1. | 1. | 1. | 1. |

MO.DA HR.MN PERIOD 94IN EXCC LOSS COMP C MO.DA HR.MN PERIOD RAIN EXCS LOSS COMP Q
 SUN 24.76 22.38 2.39 15472.
 (629.11 568.31 61.31 438.12)

HYDROGRAPH ROUTING

ROUTE THRU FONDEROSA PINES LAKE

ISTAG ICOMP IECON ITAPE JPLT JPRT INAME ISTAGE IAUTO
 2 1 0 0 0 0 1 0 0
 CLOSS CLOSS AVG ROUTING DATA
 0.0 0.000 0.00 1 1 1 0 0 0
 NSTPS NSTDL LAG AMSKK X TSK STORA ISPRAY
 1 0 0 0.000 0.000 0.000 -1485. -1

STAGE 1405.00 1405.40 1406.10 1406.70 1407.40 1408.00 1408.70 1409.40 1410.10
 FLOW 0.00 7.00 42.00 99.00 177.00 280.00 414.00 569.00 745.00
 SURFACE AREA= 0. 10. 15. 30.
 CAPACITY= 0. 51. 67. 149.
 ELEVATION= 1390. 1405. 1406. 1410.

CRFL SPWID CGW EXPV ELEV ELEV COOL CAREA EXPL
 1405.0 0.0 0.0 0.0 0.0 0.0 0.0 0.0 0.0

DAM DATA
 TOPEL C000 EXPD DAMWID
 1406.3 2.7 1.5 440.

CREST LENGTH
 AT OR BELOW
 ELEVATION

0. 90. 250.
 1406.3 1406.6 1406.8 1407.0 1407.6 1409.4 1410.8

PEAK OUTFLOW IS 49. AT TIME 42.25 HOURS

PEAK OUTFLOW IS 133. AT TIME 41.25 HOURS

PEAK OUTFLOW IS 248. AT TIME 40.75 HOURS

PEAK OUTFLOW IS 349. AT TIME 40.50 HOURS

PEAK OUTFLOW IS 447. AT TIME 40.50 HOURS

PEAK OUTFLOW IS 916. AT TIME 40.50 HOURS

ROUTE THRU LOWER RESERVOIR

| ISTAQ | ICOMP | IECON | ITAPF | JPLT | JPRT | INAME | ISTAGE | IAUTO |
|-------|-------|-------|-------|------|------|-------|--------|-------|
| 3 | 1 | 0 | 0 | 0 | 0 | 1 | 0 | 0 |

| ROUTING DATA | | LSTR | |
|--------------|-------|------|------|
| CLOSE | AVG | IPMP | IPMP |
| 0.0 | 0.000 | 1 | 0 |
| 0.0 | 0.000 | 1 | 0 |

| | | | | | | | |
|--------|--------|-----|-------|-------|-------|--------|--------|
| INSTPS | INSTDL | LAG | AMSYK | X | TSK | STORA | ISPRAT |
| 1 | 0 | 0 | 0.000 | 0.000 | 0.000 | -1391. | -1 |

[illegible]

| | | | | | | | | | | |
|------|------|-------|-------|-------|-------|--------|--------|--------|--------|--------|
| FLOW | 0.00 | 13.00 | 20.00 | 42.00 | 83.00 | 135.00 | 195.60 | 262.00 | 336.00 | 416.00 |
|------|------|-------|-------|-------|-------|--------|--------|--------|--------|--------|

SURFACE AREA:

| CAPACITY= | 0. | 4. | 8. | 32. |
|-----------|----|----|----|-----|
| 1 | | | | |
| 2 | | | | |
| 3 | | | | |
| 4 | | | | |
| 5 | | | | |
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| 98 | | | | |
| 99 | | | | |
| 100 | | | | |

ELEVATION= 1343. 1391. 1393. 1400.

| CREL | SPWID | COBW |
|------|-------|------|
| 1 | 1 | 1 |
| 2 | 2 | 2 |
| 3 | 3 | 3 |
| 4 | 4 | 4 |
| 5 | 5 | 5 |
| 6 | 6 | 6 |
| 7 | 7 | 7 |
| 8 | 8 | 8 |
| 9 | 9 | 9 |
| 10 | 10 | 10 |
| 11 | 11 | 11 |
| 12 | 12 | 12 |
| 13 | 13 | 13 |
| 14 | 14 | 14 |
| 15 | 15 | 15 |
| 16 | 16 | 16 |
| 17 | 17 | 17 |
| 18 | 18 | 18 |
| 19 | 19 | 19 |
| 20 | 20 | 20 |
| 21 | 21 | 21 |
| 22 | 22 | 22 |
| 23 | 23 | 23 |
| 24 | 24 | 24 |
| 25 | 25 | 25 |
| 26 | 26 | 26 |
| 27 | 27 | 27 |
| 28 | 28 | 28 |
| 29 | 29 | 29 |
| 30 | 30 | 30 |
| 31 | 31 | 31 |
| 32 | 32 | 32 |
| 33 | 33 | 33 |
| 34 | 34 | 34 |
| 35 | 35 | 35 |
| 36 | 36 | 36 |
| 37 | 37 | 37 |
| 38 | 38 | 38 |
| 39 | 39 | 39 |
| 40 | 40 | 40 |
| 41 | 41 | 41 |
| 42 | 42 | 42 |
| 43 | 43 | 43 |
| 44 | 44 | 44 |
| 45 | 45 | 45 |
| 46 | 46 | 46 |
| 47 | 47 | 47 |
| 48 | 48 | 48 |
| 49 | 49 | 49 |
| 50 | 50 | 50 |
| 51 | 51 | 51 |
| 52 | 52 | 52 |
| 53 | 53 | 53 |
| 54 | 54 | 54 |
| 55 | 55 | 55 |
| 56 | 56 | 56 |
| 57 | 57 | 57 |
| 58 | 58 | 58 |
| 59 | 59 | 59 |
| 60 | 60 | 60 |
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| 62 | 62 | 62 |
| 63 | 63 | 63 |
| 64 | 64 | 64 |
| 65 | 65 | 65 |
| 66 | 66 | 66 |
| 67 | 67 | 67 |
| 68 | 68 | 68 |
| 69 | 69 | 69 |
| 70 | 70 | 70 |
| 71 | 71 | 71 |
| 72 | 72 | 72 |
| 73 | 73 | 73 |
| 74 | 74 | 74 |
| 75 | 75 | 75 |
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| 79 | 79 | 79 |
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| 85 | 85 | 85 |
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| 87 | 87 | 87 |
| 88 | 88 | 88 |
| 89 | 89 | 89 |
| 90 | 90 | 90 |
| 91 | 91 | 91 |
| 92 | 92 | 92 |
| 93 | 93 | 93 |
| 94 | 94 | 94 |
| 95 | 95 | 95 |
| 96 | 96 | 96 |
| 97 | 97 | 97 |
| 98 | 98 | 98 |
| 99 | 99 | 99 |
| 100 | 100 | 100 |

| DAM DATA | | | |
|----------|------|------|--------|
| TOPEL | COCD | EXPD | DAMVID |
| 392.6 | 2.7 | 1.5 | 203. |

CHEST LENGTH
 AT CR FLOW
 ELEVATION

| Year | 1992.6 | 1992.9 | 1993.0 | 1993.2 | 1993.8 | 1995.4 |
|--------|--------|--------|--------|--------|--------|--------|
| 1992.6 | | | | | | |
| 1992.9 | | | | | | |
| 1993.0 | | | | | | |
| 1993.2 | | | | | | |
| 1993.8 | | | | | | |
| 1995.4 | | | | | | |

PEAK OUTFLOW IS 47. AT TIME 42.75 HOURS

PEAK OUTFLOW IS 133. AT TIME 41.50 HOURS

PEAK OUTFLOW IS 248. AT TIME 40.75 HOURS

PEAK OUTFLOW IS 147. AT TIME 6.37E 12.0.0

DEAN BUTLER, JR.

PEAK FLOW AND STORAGE (END OF PERIOD) SUMMARY FOR MULTIPLE PLAN-RATIO ECONOMIC COMPUTATIONS
 FLOWS IN CUBIC FEET PER SECOND (CUBIC METERS PER SECOND)
 AREA IN SQUARE MILES (SQUARE KILOMETERS)

| OPERATION | STATION | AREA | PLAN | RATIOS APPLIED TO FLOWS | | | | | | |
|---------------|---------|------|------|-------------------------|---------|---------|---------|---------|---------|---------|
| | | | | RATIO 1 | RATIO 2 | RATIO 3 | RATIO 4 | RATIO 5 | RATIO 6 | RATIO 7 |
| | | | | .10 | .20 | .30 | .40 | .50 | .75 | 1.00 |
| HYDROGRAPH AT | 1 | .27 | 1 | 94. | 189. | 283. | 377. | 471. | 707. | 943. |
| | (| .70) | (| 2.67) | 5.34) | 8.01) | 10.68) | 13.35) | 20.02) | 26.70) |
| ROUTED TO | 2 | .27 | 1 | 49. | 133. | 248. | 349. | 447. | 681. | 916. |
| | (| .70) | (| 1.38) | 3.77) | 7.03) | 9.89) | 12.65) | 19.29) | 25.93) |
| ROUTED TO | 3 | .27 | 1 | 47. | 133. | 248. | 347. | 445. | 681. | 917. |
| | (| .70) | (| 1.35) | 3.76) | 7.03) | 9.84) | 12.59) | 19.27) | 25.95) |

SUMMARY OF DAM SAFETY ANALYSIS
PONDEROSA PINES DAM

PLAN 1

| RATIO OF PPE | ELEVATION STORAGE OUTFLOW | MAXIMUM RESERVOIR W.S.-ELEV | MAXIMUM DEPTH OVER DAM | MAXIMUM STORAGE AC-FT | MAXIMUM OUTFLOW CFS | DURATION OVER TOP HOURS | TIME OF MAX OUTFLOW HOURS | TIME OF FAILURE HOURS | TOP OF DAM ELEVATION |
|--------------------|---------------------------------|-----------------------------------|------------------------------|-----------------------------|---------------------------|-------------------------------|---------------------------------|-----------------------------|-------------------------|
| | | | | | | | | | |
| .10 | 1406.17 | 0.00 | 65. | 49. | 0.00 | 42.25 | 0.00 | 1406.35 | |
| .20 | 1406.69 | .35 | 73. | 133. | 4.00 | 31.25 | 0.00 | 67. | |
| .30 | 1406.90 | .60 | 77. | 243. | 5.50 | 40.75 | 0.00 | 61. | |
| .40 | 1407.02 | .72 | 79. | 345. | 6.75 | 40.50 | 0.00 | | |
| .50 | 1407.11 | .81 | 80. | 447. | 7.25 | 40.50 | 0.00 | | |
| .75 | 1407.31 | 1.01 | 84. | 681. | 3.50 | 40.50 | 0.00 | | |
| 1.00 | 1407.47 | 1.17 | 87. | 916. | 9.75 | 40.50 | 0.00 | | |

TOP OF DAM
1406.35
67.
61.

SPILEWAY CREST
1405.00
51.
J.

INITIAL VALUE
1405.00
51.
..

SUMMARY OF DAM SAFETY ANALYSIS

LOWER DAM

PLAN 1

| | | | | | | | |
|---------------------------------|--|--------------------------------------|------|---------------------------------------|------|------------------------------------|-------|
| ELEVATION STORAGE OUTFLOW | | INITIAL VALUE 1390.80 4. 0. | | SPILLWAY CREST 1390.80 4. 0. | | TOP OF DAM 1392.60 8. 31. | |
| RATIO OF PMF | | MAXIMUM DEPTH OVER DAM | | MAXIMUM STORAGE AC-FT | | MAXIMUM OUTFLOW CFS | |
| | | | | | | DURATION OVER TOP HOURS | |
| | | | | | | TIME OF MAX OUTFLOW HOURS | |
| | | | | | | TIME OF FAILURE HOURS | |
| .10 | | 1392.84 | .24 | 9. | 47. | 4.00 | 42.75 |
| .20 | | 1393.15 | .53 | 10. | 133. | 7.25 | 41.50 |
| .30 | | 1393.31 | .71 | 10. | 248. | 8.75 | 40.75 |
| .40 | | 1393.42 | .82 | 10. | 347. | 9.75 | 40.75 |
| .50 | | 1393.52 | .92 | 11. | 445. | 10.25 | 40.50 |
| .75 | | 1393.73 | 1.13 | 11. | 681. | 11.25 | 40.50 |
| 1.00 | | 1393.91 | 1.31 | 12. | 917. | 13.00 | 40.50 |

01 NATIONAL DAM INSPECTION PROGRAM
02 PONDROSA PINES DAM--SANJOA (PEPACH ANALYSIS)
03 LIVEREY TWP, WAYNE CO. PA.

D-23

.....
 FLOOD HYDROGRAPH PACKAGE (HEC-1)
 DAM SAFETY VERSION JULY 1974
 LAST MODIFICATION 01 APR 80

RUN DATE: 01/07/28.
 TIME: 09.21.39.

NATIONAL DAM INSPECTION PROGRAM
 PONDEROSA PINES DAM--PA0304 (BREACH ANALYSIS)
 DYKERY TWP, WAYNE CO, PA.

| JOB SPECIFICATION | | | | | | | | | |
|-------------------|-----|------|-------|-----|-------|-------|------|------|-------|
| NQ | NPR | NMIN | IDAY | INR | IMIN | METRC | IPLT | IPRT | NSTAN |
| 150 | 0 | 15 | 0 | 0 | 0 | 0 | 0 | -4 | 0 |
| | | | JOPER | NWT | LROPT | TRACE | | | |
| | | | 5 | 0 | 0 | 0 | | | |

MULTI-PLAN ANALYSES TO BE PERFORMED
 MPLAN= 2 NRTIO= 2 LRTIO= 1

RRTIO= .30 .50

.....

SUR-AREA RUNOFF COMPUTATION

INFLOW TO PONDEROSA PINES (SUB-AREA 1)

| ISTAG | ICOMP | IECON | ITYPE | JPLT | JPRT | INAME | ISTAGE | LAUTO |
|-------|-------|-------|-------|------|------|-------|--------|-------|
| 1 | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 0 |

HYDROGRAPH DATA

| HYGG | IUNG | TAREA | SNAP | TRSDA | TRSPC | RATIO | ISNOW | ISAME | LUCAL |
|------|------|-------|------|-------|-------|-------|-------|-------|-------|
| 1 | 1 | .27 | 0.00 | .27 | 0.00 | 0.000 | 0 | 1 | 0 |

PRECIP DATA

| SPFE | PMS | RA | R12 | R24 | R48 | P72 | R96 |
|------|-------|--------|-------|--------|--------|------|------|
| 0.00 | 21.00 | 111.00 | 23.00 | 137.00 | 142.00 | 0.00 | 0.00 |

TRSPC COMPUTED BY THE PROGRAM IS .000

LOSS DATA

| LROPT | STPR | CLTRF | RTIOL | ERRIN | STANK | RTIOK | STRIL | CNSTL | ALSMX | RTIMP |
|-------|------|-------|-------|-------|-------|-------|-------|-------|-------|-------|
| 0 | 0.00 | 0.00 | 1.00 | 0.00 | 0.00 | 1.00 | 1.00 | .05 | 0.00 | 0.00 |

UNIT HYDROGRAPH DATA

TPE .67 CPE .45 NTA= 0

RECESSION DATA

STRIO -1.50 URESNE -.05 RRTIO= 2.00

UNIT HYDROGRAPH IN LHO--PERIOD DEBATED. LAGE .66 HOURS. CPE .45 VCE= 1.00

| LA | 70 | 111 | 109 | 79 | 63 | 50 | 30 | 31 |
|----|----|-----|-----|----|----|----|----|----|
| 24 | 70 | 111 | 109 | 79 | 63 | 50 | 30 | 31 |
| 25 | 14 | 10 | 10 | 8 | 6 | 5 | 4 | 3 |
| 26 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 |

NO.0A HR.MN PERIOD RAIN EACS LACS COME C PO.0A HR.MN PERIOD RAIN EACS LACS COME C
 SUP 24.76 22.56 2.39 15472.
 (629.31 558.11 51.31 438.12)

.....

HYDROGRAPH ROUTING

PEAK 1480 PONDERROSA PINES LANE

INST2 ICOMP IECON ITAPE JPTF JPTF JPTF INAME ICTAGE IAUTO
 2 1 0 0 0 0 0 0 0 0

ALL PLANS HAVE SAME

ROUTING DATA

CROSS CLOS 1405.40 1406.10 1406.70 1407.40 1408.00 1408.70 1409.40 1410.10
 0.0 0.00 0.00 0.00 0.00 0.00 0.00 0.00
 NSTPS 1 1 1 1 1 1 1 1
 LAG 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00
 YSK 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00
 STORA 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00
 ISORAT 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00

STAGE 1405.00 1405.40 1406.10 1406.70 1407.40 1408.00 1408.70 1409.40 1410.10
 FLOW 0.00 7.00 42.00 99.00 177.00 290.00 414.00 569.00 745.30
 SURFACE AREA 0. 10. 15. 30.
 CAPACITY 0. 51. 67. 145.
 ELEVATION 1390. 1405. 1406. 1410.

CREL SPWID CLOW FKPM ELEV COGL CAREA EXPL
 1405.0 0.0 0.0 0.0 0.0 0.0 0.0 0.0

DAM DATA

TOPFL CQOD EXPO DAMWID
 1405.3 2.7 1.5 440.
 0. 90. 250. 320. 380. 470. 510.
 1406.3 1406.6 1406.6 1407.0 1407.6 1408.4 1410.8

CREST LENGTH 0.
 AT OR BELOW 1406.3
 ELEVATION 1406.3 1406.6 1406.6 1407.0 1407.6 1408.4 1410.8

DAM PREACH DATA

1405.0 1406.3 1406.6 1407.0 1407.6 1408.4 1410.8
 10. 1.00 1331.10 .25 1405.00 1406.00

REGIN DAM FAILURE AT 40.50 HOURS
 PEAK OUTFLOW IS 40.50 AT TIME 40.75 HOURS
 REGIN DAM FAILURE AT 40.50 HOURS
 PEAK OUTFLOW IS 40.50 AT TIME 40.75 HOURS

DAM REACH DATA
 2 FLPH TFAIL WSEL FAILEL
 1.00 1391.10 .25 1405.00 1406.80

BRUID
 60.

BEGIN DAM FAILURE AT 40.50 HOURS

PEAK OUTFLOW IS 6611. AT TIME 40.74 HOURS

BEGIN DAM FAILURE AT 39.50 HOURS

PEAK OUTFLOW IS 6579. AT TIME 39.74 HOURS

HYDROGRAPH ROUTING

ROUTE THRU LOWER RESERVOIR

| I*TAQ | ICOMP | IECON | ITAPE | JPLT | JPRY | INAME | ISTAGE | IAUTO |
|-------|-------|-------|-------|------|------|-------|--------|-------|
| 1 | 1 | 0 | 0 | 0 | 0 | 1 | 0 | 0 |

ALL PLANS HAVE SAME
 ROUTING DATA

| QLOSS | CLOSS | AVG | IRES | ISAME | IOPT | IPMP | LSTR |
|-------|-------|------|------|-------|------|------|------|
| 0.0 | 0.000 | 0.00 | 1 | 1 | 0 | 0 | 0 |

| NSTPS | INSTOL | LAG | APSKK | X | TSK | STORA | ISPRAT |
|-------|--------|-----|-------|-------|-------|--------|--------|
| 1 | 0 | 0 | 0.000 | 0.000 | 0.000 | -1391. | -1 |

| STAGE | 1390.00 | 1391.60 | 1392.20 | 1393.00 | 1394.00 | 1395.00 | 1396.00 | 1397.00 | 1398.00 | 1399.00 |
|-------|---------|---------|---------|---------|---------|---------|---------|---------|---------|---------|
| FLOW | 0.00 | 13.00 | 20.00 | 42.00 | 82.00 | 135.00 | 195.00 | 262.00 | 336.00 | 416.00 |

SURFACE AREA= 0. 2. 3. 6.

CAPACITY= 0. 4. 8. 38.

ELEVATION= 1383. 1391. 1393. 1400.

| CRFL | SPWID | COQU | EXPV | ELEV | COOL | CAREA | EXPL |
|--------|-------|------|------|------|------|-------|------|
| 1390.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |

DAM DATA
 TOPEL COOD EXPD DAMJID
 1392.6 2.7 1.5 201.

| CREST LENGTH AT OR BELOW ELEVATION | 0. | 60. | 145. | 274. | 321. | 368. |
|--|--------|--------|--------|--------|--------|------|
| 1392.6 | 1392.6 | 1393.0 | 1393.2 | 1393.8 | 1395.4 | |

PEAK OUTFLOW IS 4754. AT TIME 40.75 HOURS

PEAK OUTFLOW IS 4718. AT TIME 40.75 HOURS

PEAK OUTFLOW IS 5683. AT TIME 40.75 HOURS

PEAK OUTFLOW IS 5646. AT TIME 39.75 HOURS

PEAK FLOW AND STORAGE (LEFT OF PERIOD) SUMMARY FOR MULTIPLE PLAN-RATIO ECONOMIC COMPUTATIONS
 FLOWS IN CUBIC FEET PER SECOND (CURIC METERS PER SECOND)
 AREA IN SQUARE MILES (SQUARE KILOMETERS)

RATIOS APPLIED TO FLOWS

| OPERATION | STATION | AREA | PLAN | RATIO 1 | RATIO 2 |
|---------------|---------|--------------|------|------------------|------------------|
| | | | | .30 | .50 |
| HYDROGRAPH AT | 1 | .27 (.70) | 1 | 283. | 471. |
| | 2 | | 2 | 283. (4.01) | 13.35 (13.35) |
| ROUTED TO | 1 | .27 (.70) | 1 | 5505. | 5482. |
| | 2 | | 2 | 155.89 (6.55) | 155.23 (6.52) |
| ROUTED TO | 1 | .27 (.70) | 1 | 4750. | 4718. |
| | 2 | | 2 | 154.61 (5683) | 133.61 (5646) |
| | | | | 160.92 | 159.87 |

PONDEROSA PINES DAM

[illegible]

SUMMARY OF DAM SAFETY ANALYSIS

LOWER DAM

PLAN 1

| RATIO OF PMF | ELEVATION STORAGE OUTFLOW | INITIAL VALUE | | SPILLWAY CREST | | TOP OF DAM | | TIME OF FAILURE HOURS |
|----------------------------------|---------------------------------|-----------------------------|---------------------------|-------------------------------|---------------------------------|-----------------------------|------|-----------------------------|
| | | 1390.80 | 4. | 1390.80 | 4. | 1392.60 | 8. | |
| | | 0. | | 0. | | 31. | | |
| MAXIMUM RESERVOIR W.S.ELEV | MAXIMUM DEPTH OVER DAM | MAXIMUM STORAGE AC-FT | MAXIMUM OUTFLOW CFS | DURATION OVER TOP HOURS | TIME OF MAX OUTFLOW HOURS | TIME OF FAILURE HOURS | | |
| | | | | | | | | |
| .30 | 1395.73 | 3.13 | 14. | 4754. | 5.25 | 40.75 | 0.00 | |
| .50 | 1395.71 | 3.11 | 14. | 4718. | 7.50 | 39.75 | 0.00 | |

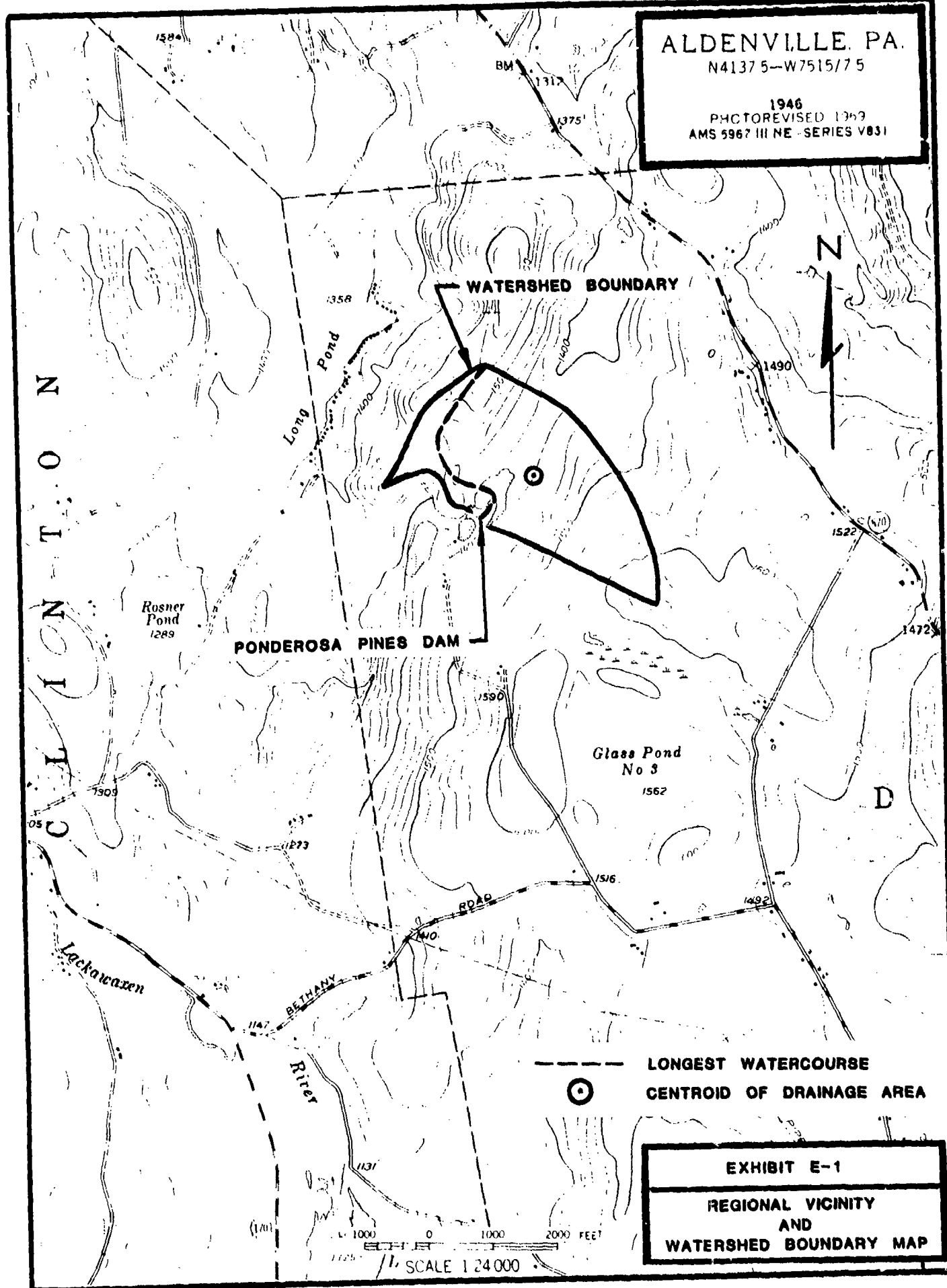
PLAN 2

| RATIO OF PMF | ELEVATION STORAGE OUTFLOW | INITIAL VALUE | | SPILLWAY CREST | | TOP OF DAM | | TIME OF FAILURE HOURS |
|----------------------------------|---------------------------------|-----------------------------|---------------------------|-------------------------------|---------------------------------|-----------------------------|------|-----------------------------|
| | | 1390.80 | 4. | 1390.80 | 4. | 1392.60 | 8. | |
| | | 0. | | 0. | | 31. | | |
| MAXIMUM RESERVOIR W.S.ELEV | MAXIMUM DEPTH OVER DAM | MAXIMUM STORAGE AC-FT | MAXIMUM OUTFLOW CFS | DURATION OVER TOP HOURS | TIME OF MAX OUTFLOW HOURS | TIME OF FAILURE HOURS | | |
| | | | | | | | | |
| .30 | 1396.04 | 3.46 | 14. | 5683. | 5.00 | 40.75 | 0.00 | |
| .50 | 1396.04 | 3.44 | 14. | 5646. | 7.50 | 39.75 | 0.00 | |

APPENDIX E

EXHIBITS

1946
PHOTO REVISÉ 1969
AMS 5967 III NE - SERIES V031



APPENDIX F

GEOLOGY

PONDEROSA PINES DAM

APPENDIX F

GEOLOGY

The Ponderosa Pines Dam and reservoir area are located within the Glaciated Allegheny Plateau Section of the Appalachian Plateau Physiographic Province. The site is about 6 miles northeast of the axis of the Northern Anthracite Coal Field of Pennsylvania. Except where bedrock is exposed, deposits of glacial drift of variable thickness cover the entire area. The drift was deposited by the Wisconsin Ice Sheet during the Pleistocene period of geologic time.

The glacial drift is composed primarily of till which is a reddish-brown, unsorted, compact mixture of clay, silt, sand, gravel, and cobbles with occasional boulder sized pieces. The stone pieces are sub-angular to rounded and consist mainly of sandstone and siltstone derived from the Catskill Formation, the dominant rock formation in the area. The clay content and compact nature of the till makes it a relatively impervious soil type.

Some deposits of glacial outwash and Kame terraces are also found in the area. These deposits are composed of loose, poorly sorted to stratified deposits of silt, sand and gravel. The Kame and outwash deposits are generally very pervious.

Other loose, pervious soils in the area are the recent deposits of alluvial silt, sand, and gravel with some clay. These soils are localized and limited to streambeds and flood plain areas.

The bedrock underlying the entire dam and reservoir area is the Catskill Formation of the Susquehanna Group. This group of formations is of Upper Devonian age. The Catskill strata generally consist of well indurated red shale, siltstone and fine sandstone with some gray, green and brown shale, siltstone and sandstone layers. Occasional conglomeratic layers are encountered. The red shales are the dominant lithology and the residual soils derived from this rock are usually high in clay and silt and contain numerous flaky and angular fragments and flat, slabby boulders. There were no exposures of bedrock at the dam site.

The regional structure of the bedrock in the area indicates that the bedrock underlying the dam and reservoir area is gently folded (dip 1° NW) to near horizontal. The regional strike of the folds is N55 $^{\circ}$ E.

Ref.: Ground Water of Northeastern Pennsylvania Stanley W. Lohman, 1937; Bulletin W-4, Pennsylvania Geologic Survey

